

3M Brand Professional Audio Recorder

Series 410



INSTRUCTION MANUAL

MINNESOTA MINING AND MANUFACTURING COMPANY
300 SOUTH LEWIS ROAD • CAMARILLO, CALIFORNIA 93010

M64 PAR 3-72

INTRODUCTION

This Instruction Manual has been prepared for the convenience and use of owners of the 3M Brand Professional Audio Recorder. The manual is supplied with each recorder shipped from the factory, and should be consulted before installation and operation of the recorder is attempted.

Eight head and speed configurations of this model are presented in the text of this manual. They are: 1/2 inch, 4 track, 7 1/2 and 15 ips, 60 Hz; 1/2 inch, 4 track, 15 and 30 ips, 60 Hz; 1/4 inch, 2 track, 7 1/2 and 15 ips, 60 Hz; 1/4 inch, 2 track, 15 and 30 ips, 60 Hz; and the above four at 50 Hz. A 1/4 inch full track is available upon special order.

The text will note the differences, where applicable, in the above configurations including the 1/4 inch full track. Differences are mainly found in the heads, and in the capstan drive motors listed in the parts list section. Operation and maintenance of all models are identical.

FOR SALES INFORMATION

WESTERN U. S.

Mincom Division
3M Company
300 South Lewis Road
Camarillo, California 93010
(805) 482-1911

EASTERN U. S.

Mincom Division
3M Company
4701 Lydell Avenue
Cheverly Industrial Center
Cheverly, Maryland 20781
(301) 773-5050

NORTHEAST

76 Bryant Road
Blackwood, New Jersey 08012
(609) 227-2228

FOR PARTS AND SERVICE

WESTERN U. S.

Mincom Division
3M Company
300 South Lewis Road
Camarillo, California 93010
(805) 482-1911

EASTERN U. S.

Mincom Division
3M Company
4701 Lydell Avenue
Cheverly Industrial Center
Cheverly, Maryland 20781
(301) 773-5050

LIST OF EFFECTIVE PAGES

This page indicates the effective pages for a specific issue of this publication. The latest issue of this publication may not be the correct version for your equipment. When ordering a publication, please specify the issue originally received with the equipment.

To order a publication, give the catalog number of this publication, and the complete manual number shown at the bottom of this page.

Issue, date and manual number are:

Issue . . . 1 . . Feb. 71
Issue . . . 2 . . Mar. 72

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 196 CONSISTING OF THE FOLLOWING:

Page No.	Issue No.	Page No.	Issue No.
Title	2	103A/104A	2
A	2	105/106	2
i through v/vi	1	107 through 112	1
1 through 102	1	113/114 through 117/118	2
103/104	2	119 through 204	1

This manual is Catalog No. 83-5990-1174.

TABLE OF CONTENTS

	Page
GENERAL DESCRIPTION	
Functional Description	1
Isoloop Tape Transport	1
Physical Description	4
Equipment Description	4
Specifications	10
INSTALLATION	
Receipt Inspection	11
General	11
Location Considerations	11
Console Model Installation	11
Rack (or Custom) Mounting	12
Electrical Connections	18
Power and Control Cable	18
Head Cables	18
Signal Connectors	18
Pilot Tone	18
Remote Control	20
Edit Foot Control	20
Power Cord	20
Interface Information	20
Signal Input	20
Signal Output	21
Remote Meter	21
Pilot and Loudspeaker	22
Phones	22
Auxiliary Ground	23/24
OPERATING CONTROLS AND DETAILS	
Tape Transport Controls	25
PLAY Button	25
FORWARD Button	25
STOP Button	26
REWIND Button	26
RECORD Button	26
POWER Switch	26
A-B OUTPUT Transfer Switch	27
RUNOUT Switch	27
SPEED Switch	27
BALANCE Switch	27

TABLE OF CONTENTS (Continued)

	Page
OPERATING CONTROLS AND DETAILS (Cont.)	
Tape Transport, Tape Handling Components	27
Reversing Idler	27
Head Assembly	27
Tape Lifters	29
Head Shield Door	29
Capstan	29
Capstan Idler (Incoming)	29
Capstan Idler (Outgoing)	29
Tape - Threaded Sensor	29
Reel Holders	30
Electronics Assemblies	30
RECORD LEVEL Control	30
REPRO. LEVEL Control	30
REC. SELECT Switch	30
METER Switch	31
OUTPUT SELECT Switches	32
REC. Indicator	32
PHONES Jack	32
GENERAL OPERATING PROCEDURES	
Preliminary	33
Threading	33
Monitoring	33
Recording	35
Playback	36
Overdubbing	36
Erase	36
ALIGNMENT AND ADJUSTMENT	
Tape Transport	37
Capstan Belt Adjustment	40
Flutter	48
Record Alignment	54
15 IPS Tape Speed Alignment	54
7 1/2 IPS Tape Speed Alignment	55
Dynamic Range Adjustment (NAB)	56
Miscellaneous Adjustments and Circuit Arrangements	58
Heads	60
Tape Guides	60
Reel Hubs	61

TABLE OF CONTENTS (Continued)

Page

MAINTENANCE

General Precautions	63
Troubleshooting	64
Field Service	72
Factory Repair Service	72

PRINCIPLES OF OPERATION

Introduction	73
Tape Drive Components	73
Tape Transport Circuit Descriptions	75
Power Circuits	77
Threaded Tape Condition	77
From Standstill to Play	78
From Play to Stop	78
From Stop to Rewind	79
From Rewind to Stop (Tape Moving in Rewind Direction)	79
From Rewind to Stop (Tape Moving in Forward Direction)	80
From Stop to Forward	80
From Forward to Stop (Tape Moving in Forward Direction)	80
From Forward to Stop (Tape Moving in Rewind Direction)	81
From Forward to Rewind	81
From Rewind to Forward	81
From Rewind to Play	82
From Forward to Play	82
Tape Runout	83
Record Mode Operation	83
Speed Change Switch	83
Reel Size Switch	83
Torque Control Relay	84
Monitor Switching	84
Runout Switch	85
Fail-Safe Brakes	85
Signal Electronics Functions	85
NAB Electronics	85
NAB Recording	85
NAB Reproducing	87
Detailed Circuit Descriptions	89
NAB Record Amplifier (4)	89
Bias and Erase Amplifier (1)	90
Preamplifier (7/9)	91
Line Amplifier (6)	93
Power Supply Assembly (5)	94
NAB Erase Coupler (3N)	95/96

TABLE OF CONTENTS (Continued)

	Page
SCHEMATICS	
PARTS LISTS	
Introduction	121
Ordering Replacement Parts	121

LIST OF ILLUSTRATIONS

Figure No.		Page
1	3M Brand Professional Audio Recorder	2
2	Isoloop Tape Drive	3
3	3M Brand Professional Audio Tape Recorder Systems	5
4	Tape Transport	6
5	Electronics Assembly (One Channel)	7
6	Outline Dimensions, Console Models	13
7	Outline Dimensions for Rack Mounting and Custom Installations	14
8	Typical Rack Mounting Layout	15
9	Transporter Case Outline Dimensions	16
10	Cable Connections	17
11	Signal Input Connector Wiring	20
12	Signal Output Connector Wiring	21
13	Pilot Connector Wiring	22
14	Tape Drive Components	28
15	Electronic Controls	31
16	Tape Threading	36
17	Tape Transport Adjustments, Top View	38
18	Tape Transport Adjustments, Bottom View	39
19	Capstan Motor Mounting Bracket	41
20	Example of Simple Stroboscope Lamp	42
21	Electronics Assembly Adjustment Locations	51
22	Record and Playback Head Azimuth Adjustments	53
23	Reel Hub Adjustment	62
24	Tape Recorder, Block Diagram	74
25	Tape Transport Schematic	99/100
26	Tape Transport Circuit Board Layout	101/102
27	Tape Transport Wiring Diagram	103/104
28	Electronics Block Diagram	105/106
29	Remote Control Assembly Schematic	107/108
30	Bias and Erase Amplifier Schematic	109/110
31	NAB Erase Coupler Schematic	111/112

LIST OF ILLUSTRATIONS (Continued)

Figure No.		Page
32	NAB Record Amplifier Schematic	113/114
34	Electronics Assembly Power Supply Schematic	115/116
34	Line Driver Amplifier Schematic	117/118
35	NAB Preamplifier with Overdub Schematic	119/120
36	Tape Editing Switch Assembly	
37	Tape Deck Assembly	
38	Remove Control Assembly	
39	Audio Signal Electronics Housing Assembly	

LIST OF TABLES

Table No.		Page
1	3M Brand Professional Audio Recorder Components	8
2	Standard Dynatrack and NAB Head and Signal Cable Connections	19
3	Capstan Speed Error (for 48 element strobe wheel)	42
4	Spring Scale Reading to Motor Torque Conversion Table	44
5	Takeup Motor Torques	44
6	Supply Motor Torques	45
7	Components Contributing to Flutter	48
8	Troubleshooting	64
9	Line Operating Level Calibrating Resistors	94
10	Parts List Index	122

GENERAL DESCRIPTION

The 3M Brand Professional Audio Recorder is manufactured by the Mincom Division of the 3M Company in Camarillo, California. It fulfills a requirement in the professional recording industry for the ultimate quality in tape recording. The continued improvements in records, tapes, and playback equipment revealed deficiencies in original master recordings. The 3M Brand Professional Audio Recorder overcomes these problems and provides improved master music tapes - - improvement readily discernible by ear.

The 3M Brand Professional Audio Recorder provides a significant improvement over present professional audio recorders in three basic areas. Probably the most important of these is the improved dynamic range. The second area of improvement is a new tape drive system that reduces flutter to half that present in other tape transports in the audio field. Third, the entire system affords an operating ease unmatched by any other tape recorder. Other improvements not readily apparent, are an increase in the long-term reliability due to the exclusive use of silicon transistors in the electronics assemblies plus the simplified tape-drive system.

The 3M Brand Professional Audio Recorder achieves its outstanding performance from a patented technique of an Isoloop tape drive system; plus experience gained from over a decade of design and manufacture of Mincom, state-of-the-art, aerospace tape recorder/reproducer systems.

FUNCTIONAL DESCRIPTION

Functionally, the 3M Brand Professional Audio Recorder operates on the same basic principles as any other tape recorder. These principles are covered in many text books and will not be presented in this manual. As stated, the feature that gives this recorder its outstanding performance is the Isoloop tape drive.

ISOLOOP TAPE TRANSPORT

The tape transport mechanism of the 3M Brand Professional Audio Recorder is derived from designs used in instrumentation recorders, where standards of timing accuracy, and wow and flutter are even more demanding than they are in audio recording. The heart of the patented Isoloop tape drive is the differential capstan, which maintains a constant tape tension within the drive and positive contact of the tape against the heads (figure 2). In addition, the unsupported tape path is extremely short in comparison to standard design tape recorders. This short path reduces longitudinal oscillation to a new low and eliminates the need for a series of tape guides to maintain a proper tape path.

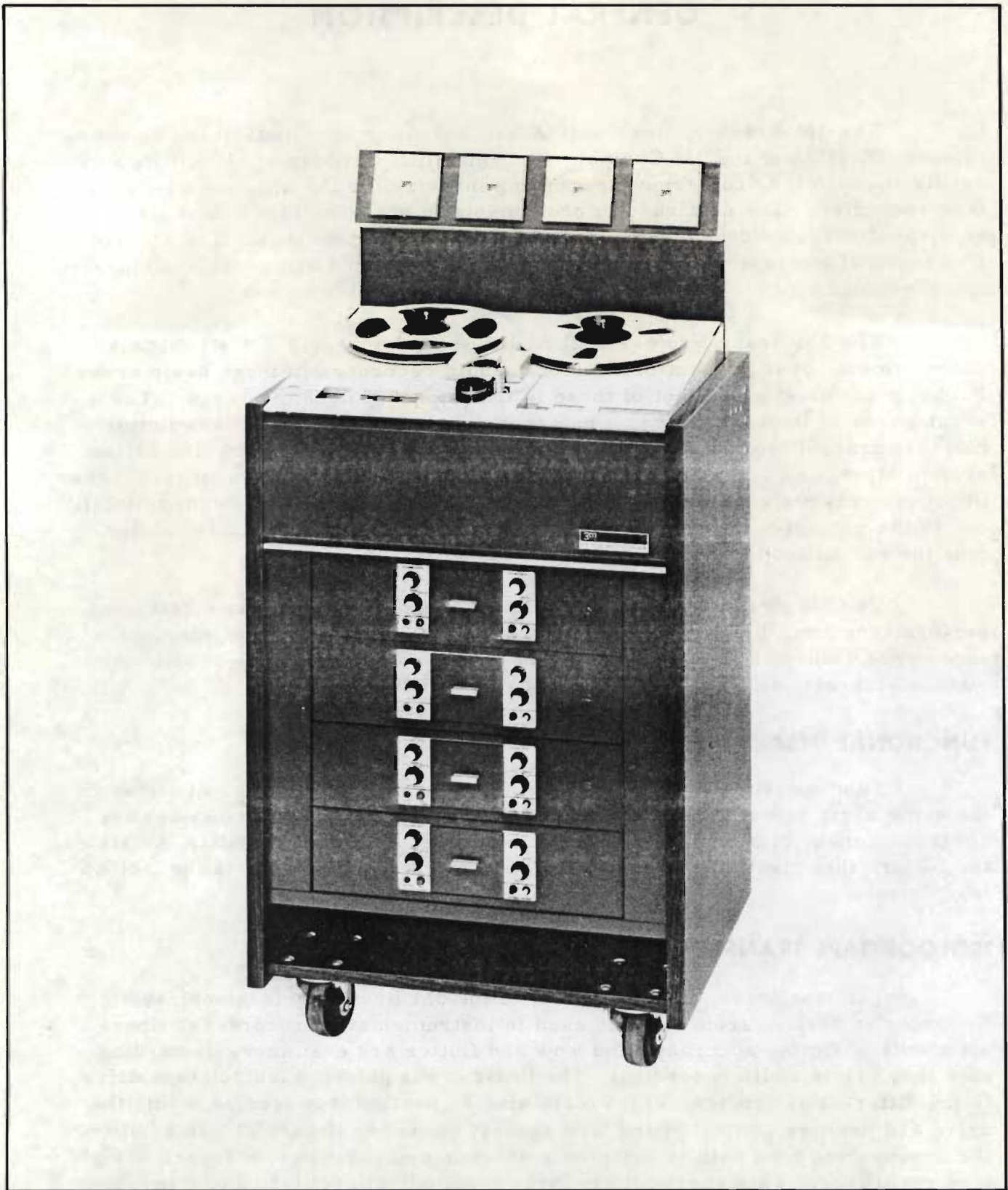


Figure 1. 3M Brand Professional Audio Recorder

The tape tension required to minimize flutter and hold the tape against the heads is generated within the closed loop by the differential drive capstan. The tape drive surface of the capstan is divided into regions of two different diameters. The incoming idler roller is contoured so as to press the tape firmly into the matching "grooves" (of the smaller diameter) of the capstan. The outgoing idler roller is shaped so as to press the tape firmly against the "ridges" (of the larger diameter) of the capstan. This differential of capstan diameters constantly tries to extract more tape than is being fed into the loop and creates the necessary tension by means of the slight elasticity of the tape itself. This tape tension is always kept safely within its elastic limits.

The Isoloop tape drive, short tape path, and flywheel driven capstan all aid in reducing the flutter of the tape transport to approximately half that found in other professional tape drive systems.

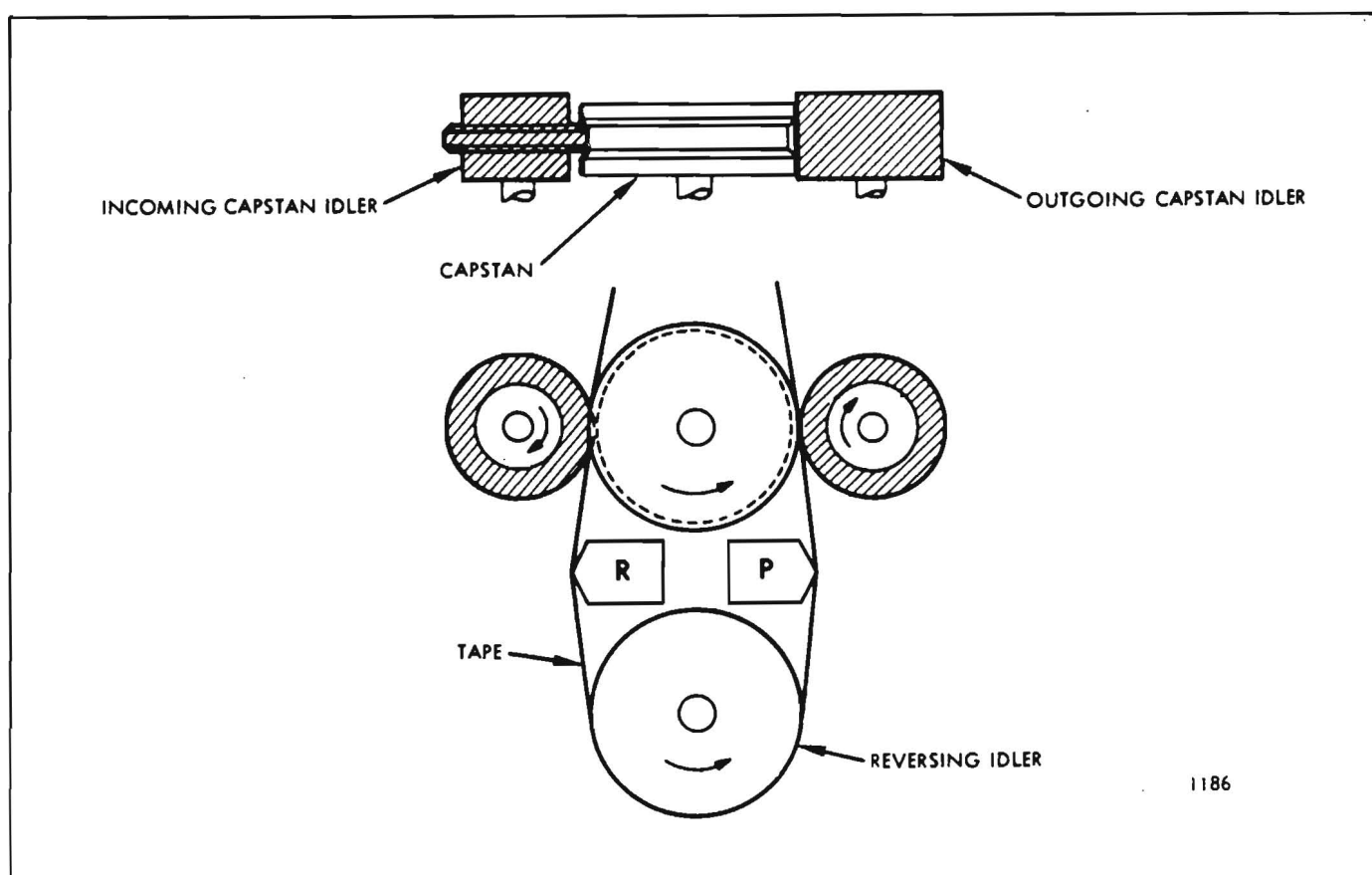


Figure 2. Isoloop Tape Drive

PHYSICAL DESCRIPTION

The recorder is supplied in eight configurations. It is available in a standard console, or unmounted for installation in a 19-inch equipment rack (figure 3). Complete installation instructions are given under Installation. Physically, each recorder consists of a tape transport and electronics as required. This may be either 2 or 4 channels of NAB electronics. A single channel is available on special order for use with a 1/4-inch full track recorder.

EQUIPMENT DESCRIPTION

Each tape recorder will have a tape transport (figure 4), and one electronics assembly (figure 5) for each record and play channel, see table 1. Also, a recorder may have any of the accessories listed in table 1.

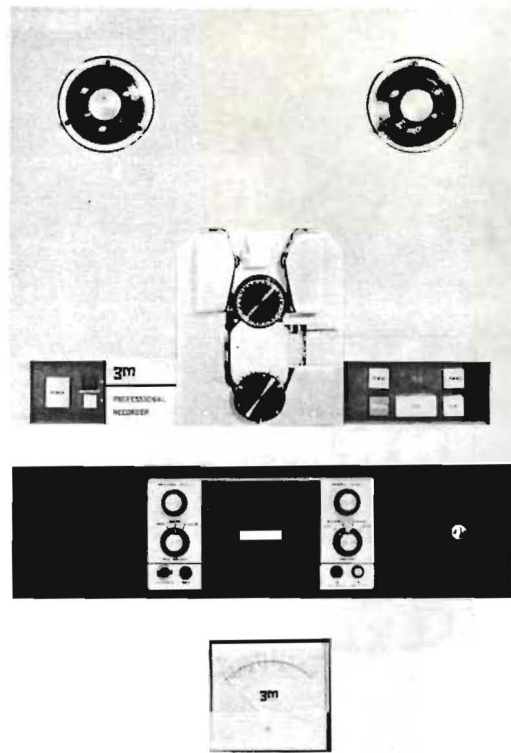
The basic tape transport is the same in all recorders, the only difference is in the tape width, magnetic heads, and capstan speed. The tape guides and magnetic heads are installed depending upon the number and type of channels. The transport is available with either of two capstan sizes - 1/4-inch or 1/2-inch tape.

The electronics assembly contains the electronics required for a single channel of NAB record and playback. Each electronics assembly contains a plug-in power supply, controls and indicators, and five plug-in circuit boards. There is an input and an output transformer located behind the control panel. All electrical connections for each channel are made on the rear panel of the electronics assembly. A VU meter for each electronic assembly is located on the meter display panel.

The electronics assembly plug-in circuit boards are numbered 1, 3, 4, 6, and 7/9 on the board handle indicating the slot that the board goes in. Slot 2 is always empty and the power supply is slot 5. An optional plug-in circuit board 7/9 can be installed in slot 9 if permanent overdubbing is desired without having to remove circuit board 7/9 from slot 7.

The tape transport operates at either of two electrically selectable tape speeds. The speeds are 7-1/2 and 15 ips or 15 and 30 ips. The electronics equalization is automatically switched to the selected tape speed.

The tape transport contains the tape motion controls and tape handling controls; plus, it performs functions common to all of the electronic assemblies. It provides tape speed equalization control, the source of bias and erase frequency, the A-B transfer function, and control of the record function. The POWER button on the transport controls the power to the entire system. The electronics assembly contains all of the remaining controls, such as the record and reproduce level controls, and the meter control.



UNMOUNTED

Consists of tape transport and electronics. Transport is complete with required magnetic heads and ready for horizontal or vertical mounting. Electronics are individual modular panels and provide standard NAB.

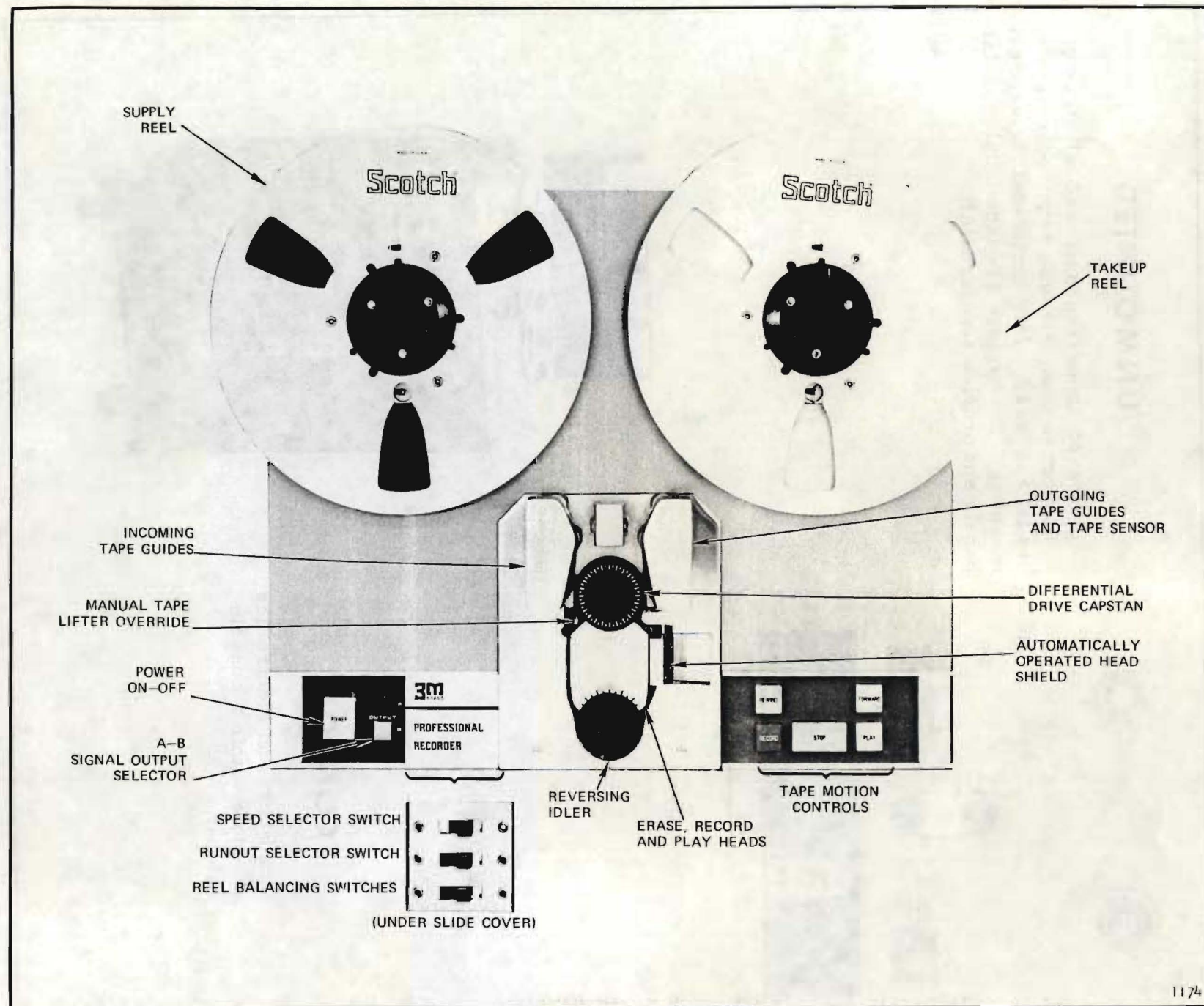
CONSOLE

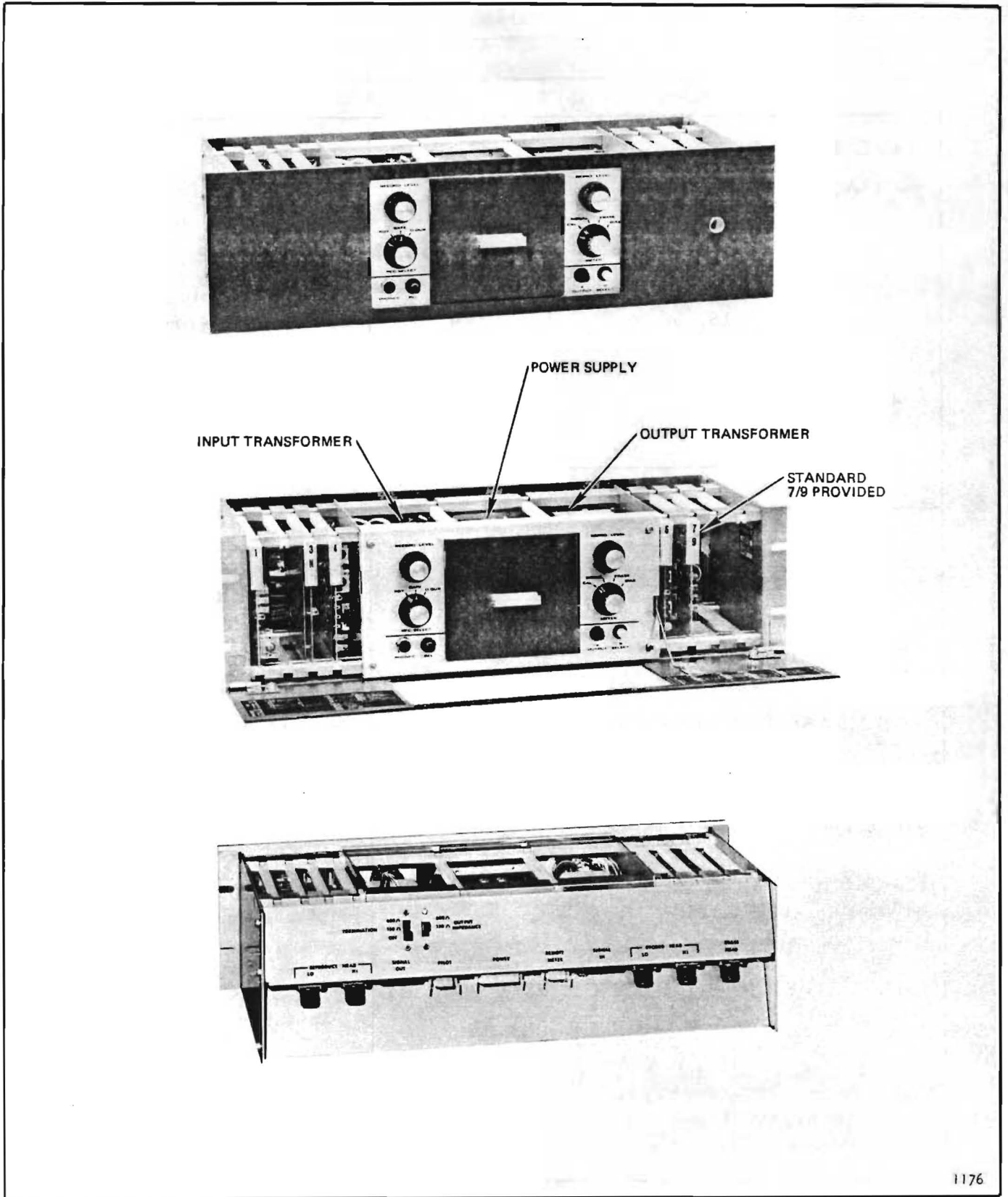
Transport and electronics mounted within a console cabinet.



Figure 3. 3M Brand Professional Audio Tape Recorder Systems

Figure 4. Tape Transport





1176

Figure 5. Electronics Assembly (One Channel)

Table 1. 3M Brand Professional Audio Recorder Components

COMPONENT				DESCRIPTION
TAPE TRANSPORT CHASSIS ASSEMBLY				
TAPE TRANSPORT ASSEMBLY				This assembly is used for either 60 Hz or 50 Hz input power.
64013A085	<u>Speed (ips)</u>	<u>Tracks</u>	<u>Tape</u>	
	7 1/2, 15	4	1/2 inch	
	15, 30	4	1/2 inch	
64013A080	7 1/2, 15	2	1/4 inch	This assembly is used for either 60 Hz or 50 Hz input power.
	15, 30	2	1/4 inch	
COVER PLATE				
23000A005-1	24 inch (10 1/2 inch reel)			
ELECTRONICS ASSEMBLY				
ELECTRONICS ASSEMBLY				Consists of the basic electronics chassis assembly less all of the plug-in units.
64059A010				
BIAS & ERASE AMPLIFIER CIRCUIT BOARD				Part of the record circuit - installed in slot 1.
23059A020				
NAB ERASE COUPLER CIRCUIT BOARD				Part of the NAB record circuit - installed in slot 3.
23059B030				
NAB RECORD AMPLIFIER CIRCUIT BOARD				Part of the record circuit - installed in slot 4.
23059B040				
POWER SUPPLY ASSEMBLY				Power supply - installed in slot 5.
64031A000-1 (4 track)				
64031A000-2 (2 track)				
LINE DRIVER AMPLIFIER CIRCUIT BOARD				Part of the reproduce circuit - installed in slot 6.
23059A060				
NAB PREAMPLIFIER WITH OVERDUB				Part of the reproduce circuit with overdub feature - normally used in slot 7. Installed in slot 9 for overdub operation.
23059B090-1 (7.5 - 15 ips)				
23059B090-2 (15 - 30 ips)				

Table 1. 3M Brand Professional Audio Recorder Components (Cont'd)

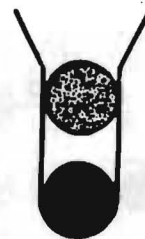
COMPONENT	DESCRIPTION
METER HOUSING PANEL	
Housing Panel 22028A040-2	VU meters are mounted on this panel. Two (2) meters for 2 track; four (4) meters for 4 track. Special order 1/4 inch, full track panel utilizes 1 meter.
VU Meter 23059B052	Monitors record, playback, as erase signal levels, and the magnitude of high frequency bias current.
CABLES	
TRANSPORT-TO-ELECTRONICS POWER AND CONTROL CABLES 23028A050 (2 and 4 track)	3-foot cable, 15-pin connectors.
HEAD CABLES 23000A010-2 (2 tracks) 23000A010-4 (4 tracks)	This cable is about 66 inches long, and connects between the head plate on the transport and ehca channel of electronics. There is a play (P), record (R), and erase (E) head cable for each track.
ACCESSORIES	
REMOTE CONTROL (with 5-foot cable) 23017A000	This unit provides remote control of the RECORD, PLAY, STOP, REWIND, FORWARD, and A-B OUTPUT transfer functions.
REMOTE CONTROL EXTENSION CABLE 23017A010	A 25-foot extension cable for the remote controls.
EDIT FOOT SWITCH 23000A950	Permits hand-free spill/standby/wind for rapid tape editing.
EXTENDER BOARD 23059A110	Extender board for circuit boards in the electronics assembly.

SPECIFICATIONS.

Specifications for the 3M Brand Professional Tape Recorder are presented at the end of this section. These specifications are based upon operation in accordance with the procedures and conditions presented in this manual. Deviation from these procedures, use of other than recommended magnetic tapes, or modification of the equipment may result in degradation of the equipment performance. These specifications are subject to change without notice.



PROFESSIONAL RECORDING SYSTEMS



Model PAR 410 M-64

1/2 Inch 4 Track

Recorder/Reproducer

Console Mounted

SPECIFICATIONS

NAB ELECTRONICS

NUMBER OF CHANNELS: 4

SIGNAL-TO-NOISE RATIO:

	Standby	Biased Tape
Normal	65 dB	62 dB

70 mil track width 20 Hz - 20 kHz bandwidth, with reference to 3% maximum third harmonic distortion level at 700 Hz, using tape specified below.

TAPE TYPE: Specifications based on employment of "Scotch" Brand recording tape 201, 202, 203, 206, or 207. Adjustable bias and equalization permits accommodation of wide range of tape characteristics.

EQUALIZATION: Machines are normally equalized to NAB 15 and 7 1/2 ips speeds. Equalizers automatically switched when tape speed is changed. Other forms of equalization may be provided on order.

FREQUENCY RESPONSE:

7.5 ips reproduce	±2 dB 30 Hz - 12 kHz
7.5 ips record/reproduce response	±2 dB 30 Hz - 12 kHz
15 ips reproduce	±2 dB 30 Hz - 15 kHz
15 ips record/reproduce	±2 dB 30 Hz - 15 kHz

PHASING: On all channels signal input to output polarity is maintained. 1 mil wavelength phase error less than 90° between any two tracks.

CHANNEL SEPARATION: Channel to channel crosstalk separation is greater than 50 dB at 500 cycles (zero VU).

ELECTRONICS INPUT: 20,000 ohm fully floating or unbalanced line. -10 dBm to +8 dBm signal on 600 ohm bus.

ELECTRONICS OUTPUT: +4 dBm reference level into 600 ohms. Distortion less than 1% at +28 dBm. 600 ohm termination switch provided.

PHASE CORRECTION: Playback amplifier includes phase rotation circuit to optimize square wave and transient response for each speed.

BIAS AND ERASE OSCILLATOR. Master oscillator on tape transport supplies 120 kHz low impedance bus feeding individual bias and erase power amplifiers for each channel.

DEGREE OF ERASURE: A 1,000 cycle signal at 3% distortion level is reduced 72 dB or more by the erase head.

POWER INPUT: 110 to 135 volts ac, 60 cycles. Internally regulated power supplies make transformer tap changes unnecessary over this range. Optional 50 cycles power.

MECHANICAL

SIZE AND WEIGHT:

Height: 53-3/4 inches.

Width: 27 inches.

Depth: 22-1/2 inches.

Weight: Approximately 250 pounds.

SPEED: 7-1/2 and 15 ips standard. 15 and 30 ips available.

REEL SIZES: NAB hub. Adaptable to CCIR or small plastic reel hubs. Standard reel 10-1/2" diameter. Alternatively, 11-1/2" diameter reels can be furnished for CCIR applications.

FLUTTER:

Speed (ips)	Flutter Band (Hz)	Maximum Flutter (rms)
30	0.5 to 200	0.05%
	0.5 to 5000	0.08%
15	0.5 to 200	0.06%
	0.5 to 5000	0.08%
7-1/2	0.5 to 200	0.1%
	0.5 to 5000	0.15%

NOTE: All measurements of flutter made by recording a tone on machine under test, rewinding and measuring flutter on replay. Flutter measurement is maximum cumulative unweighted.

TIMING ACCURACY: ±0.1%.

START TIME: Less than 1.0 seconds to reach sync speed.

STOP TIME: 1.0 second from play or record mode.

REWIND TIME: 1.7 minutes for 2,400 feet.

TRANSPORT CONTROLS: Operating controls located on lower edge of transport.

Left Corner: POWER ON/OFF (backlighted pushbutton)
SPEED HIGH/LOW (slide switch)
OUTPUT A (pushbutton) - Commands signal electronics to present incoming lines to output jacks of recorder.
OUTPUT B (pushbutton) - Commands signal electronics to present the recorded signals at the output jacks.

Right Corner: Backlighted pushbuttons for
PLAY FORWARD
RECORD* REWIND
STOP

*Play and record button must be pressed simultaneously to initiate the record mode.



PROFESSIONAL RECORDING SYSTEMS



Model PAR 410 M-64
1/4 Inch 2 Track
Recorder/Reproducer

Console Mounted

SPECIFICATIONS

NAB ELECTRONICS

NUMBER OF CHANNELS: 2

SIGNAL-TO-NOISE RATIO:

	Standby	Biased Tape
Normal	65 dB	62 dB

70 mil track width 20 Hz - 20 kHz bandwidth, with reference to 3% maximum third harmonic distortion level at 700 Hz, using tape specified below.

TAPE TYPE: Specifications based on employment of "Scotch" Brand recording tape 201, 202, 203, 206, or 207. Adjustable bias and equalization permits accommodation of wide range of tape characteristics.

EQUALIZATION: Machines are normally equalized to NAB 15 and 7 1/2 ips speeds. Equalizers automatically switched when tape speed is changed. Other forms of equalization may be provided on order.

FREQUENCY RESPONSE:

7.5 ips reproduce	±2 dB 30 Hz - 12 kHz
7.5 ips record/reproduce response	±2 dB 30 Hz - 12 kHz
15 ips reproduce	±2 dB 30 Hz - 15 kHz
15 ips record/reproduce	±2 dB 30 Hz - 15 kHz

PHASING: On all channels signal input to output polarity is maintained. 1 mil wavelength phase error less than 90° between any two tracks.

CHANNEL SEPARATION: Channel to channel crosstalk separation is greater than 50 dB at 500 cycles (zero VU).

ELECTRONICS INPUT: 20,000 ohm fully floating or unbalanced line. -10 dBm to +8 dBm signal on 600 ohm bus.

ELECTRONICS OUTPUT: +4 dBm reference level into 600 ohms. Distortion less than 1% at +28 dBm. 600 ohm termination switch provided.

PHASE CORRECTION: Playback amplifier includes phase rotation circuit to optimize square wave and transient response for each speed.

BIAS AND ERASE OSCILLATOR. Master oscillator on tape transport supplies 120 kHz low impedance bus feeding individual bias and erase power amplifiers for each channel.

DEGREE OF ERASURE: A 1,000 cycle signal at 3% distortion level is reduced 72 dB or more by the erase head.

POWER INPUT: 110 to 135 volts ac, 60 cycles. Internally regulated power supplies make transformer tap changes unnecessary over this range. Optional 50 cycles power.

MECHANICAL

SIZE AND WEIGHT:

Height: 53-3/4 inches.
Width: 27 inches.
Depth: 22-1/2 inches.
Weight: Approximately 250 pounds.

SPEED: 7-1/2 and 15 ips standard. 15 and 30 ips available.

REEL SIZES: NAB hub. Adaptable to CCIR or small plastic reel hubs. Standard reel 10-1/2" diameter. Alternatively, 11-1/2" diameter reels can be furnished for CCIR applications.

FLUTTER:

Speed (ips)	Flutter Band (Hz)	Maximum Flutter (rms)
30	0.5 to 200	0.05%
	0.5 to 5000	0.08%
15	0.5 to 200	0.06%
	0.5 to 5000	0.08%
7-1/2	0.5 to 200	0.1%
	0.5 to 5000	0.15%

NOTE: All measurements of flutter made by recording a tone on machine under test, rewinding and measuring flutter on replay. Flutter measurement is maximum cumulative unweighted.

TIMING ACCURACY: ±0.1%.

START TIME: Less than 1.0 seconds to reach sync speed.

STOP TIME: 1.0 second from play or record mode.

REWIND TIME: 1.7 minutes for 2,400 feet.

TRANSPORT CONTROLS: Operating controls located on lower edge of transport.

Left Corner: POWER ON/OFF
(backlight pushbutton)
SPEED HIGH/LOW
(slide switch)
OUTPUT A (pushbutton) - Commands
signal electronics to present incoming
lines to output jacks of recorder.
OUTPUT B (pushbutton) - Commands
signal electronics to present the recorded
signals at the output jacks.

Right Corner: Backlight pushbuttons for

PLAY	FORWARD
RECORD*	REWIND
STOP	

*Play and record button must be pressed simultaneously to initiate the record mode.



PROFESSIONAL RECORDING SYSTEMS



Model PAR 410 M-64
1/4 Inch Full Track
Recorder/Reproducer

Console Mounted

SPECIFICATIONS

NAB ELECTRONICS

NUMBER OF CHANNELS: 1

SIGNAL-TO-NOISE RATIO:

	Standby	Biased Tape
Normal	68 dB	65 dB

200 mil track width 20 Hz - 20 kHz bandwidth, with reference to 3% maximum third harmonic distortion level at 700 Hz, using tape specified below.

TAPE TYPE: Specifications based on employment of "Scotch" Brand recording tape 201, 202, 203, 206, or 207. Adjustable bias and equalization permits accommodation of wide range of tape characteristics.

EQUALIZATION: Machines are normally equalized to NAB 15 and 7 1/2 ips speeds. Equalizers automatically switched when tape speed is changed. Other forms of equalization may be provided on order.

FREQUENCY RESPONSE:

7.5 ips reproduce	±2 dB 30 Hz - 12 kHz
7.5 ips record/reproduce response	±2 dB 30 Hz - 12 kHz
15 ips reproduce	±2 dB 30 Hz - 15 kHz
15 ips record/reproduce	±2 dB 30 Hz - 15 kHz

ELECTRONICS INPUT: 20,000 ohm fully floating or unbalanced line. -10 dBm to +8 dBm signal on 600 ohm bus.

ELECTRONICS OUTPUT: +4 dBm reference level into 600 ohms. Distortion less than 1% at +28 dBm. 600 ohm termination switch provided.

PHASE CORRECTION: Playback amplifier includes phase rotation circuit to optimize square wave and transient response for each speed.

BIAS AND ERASE OSCILLATOR. Master oscillator on tape transport supplies 120 kHz low impedance bus feeding bias and erase power amplifiers.

DEGREE OF ERASURE: A 1,000 cycle signal at 3% distortion level is reduced 72 dB or more by the erase head.

POWER INPUT: 110 to 135 volts ac, 60 cycles. Internally regulated power supplies make transformer tap changes unnecessary over this range. Optional 50 cycles power.

MECHANICAL

SIZE AND WEIGHT:

Height: 53-3/4 inches.
Width: 27 inches.
Depth: 22-1/2 inches.
Weight: Approximately 225 pounds

SPEED: 7-1/2 and 15 ips standard. 15 and 30 ips available.

REEL SIZES: NAB hub. Adaptable to CCIR or small plastic reel hubs. Standard reel 10-1/2" diameter. Alternatively, 11-1/2" diameter reels can be furnished for CCIR applications.

FLUTTER:

Speed (ips)	Flutter Band (Hz)	Maximum Flutter (rms)
30	0.5 to 200	0.05%
	0.5 to 5000	0.08%
15	0.5 to 200	0.06%
	0.5 to 5000	0.08%
7-1/2	0.5 to 200	0.1%
	0.5 to 5000	0.15%

NOTE: All measurements of flutter made by recording a tone on machine under test, rewinding and measuring flutter on replay. Flutter measurement is maximum cumulative unweighted.

TIMING ACCURACY: ±0.1%.

START TIME: Less than 1.0 seconds to reach sync speed.

STOP TIME: 1.0 second from play or record mode.

REWIND TIME: 1.7 minutes for 2,400 feet.

TRANSPORT CONTROLS: Operating controls located on lower edge of transport.

Left Corner: POWER ON/OFF
(backlighted pushbutton)
SPEED HIGH/LOW
(slide switch)
OUTPUT A (pushbutton) - Commands signal electronics to present incoming lines to output jacks of recorder.
OUTPUT B (pushbutton) - Commands signal electronics to present the recorded signals at the output jacks.

Right Corner: Backlighted pushbuttons for
PLAY FORWARD
RECORD* REWIND
STOP

*Play and record button must be pressed simultaneously to initiate the record mode.

IMPORTANT NOTICE

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed. 3M reserves the right to modify the specifications and equipment prior to delivery, to incorporate desirable or necessary electrical or mechanical changes.

3M's only obligation shall be to replace such part of the equipment proved to be defective in accordance with our warranty. 3M shall not be liable for any injury,

loss or damage, direct or consequential, arising out of the use of or the inability to use the equipment. Before using, user shall determine the suitability of the product for his intended use, and user assumes all risk and liability whatsoever in connection therewith.

No statement or recommendation not contained herein shall have any force or effect unless in an agreement signed by officers of 3M.

INSTALLATION

RECEIPT INSPECTION

The 3M Brand Professional Audio Recorder was inspected, completely checked out, and adjusted before leaving the factory. Immediately upon receipt, inspect the equipment for any shipping damage. If any damage is noticed, notify the carrier immediately. If everything is normal, proceed with the installation.

GENERAL

As previously described, the recorder comes in two basic models: console, and rack mounting. Console models are completely connected and ready for operation when unpacked and the power and signal connections are made. The rack model requires, in addition to the power and signal connections, interconnecting cables between the tape transport and electronics; in addition, they must be installed in a 19-inch equipment rack.

This section contains installation instructions for each of the two models, plus instructions for each of the standard accessories.

LOCATION CONSIDERATIONS

The tape recorder can be installed in almost any location as long as reasonable judgement is used. The recorder should not be installed in an extremely dusty or damp location. Strong magnetic fields should be avoided, such as from power transformers and tape degaussers. The tape recorder can probably stand high temperatures much better than its human operator; however, if the recorder is to be installed in an equipment rack, it should not be mounted above a chassis with vacuum tubes or anything which generates a large amount of heat.

The tape recorder can be remotely controlled. The standard remote control cables are 5 and 25 feet long; however, longer cables can be used.

CONSOLE MODEL INSTALLATION

Console models are shipped from the factory ready for operation. They are crated according to standard commercial practices, depending upon their destination. In some cases, the crating may be extensive and the receiver must be careful when unpacking not to damage the equipment or discard any separately packaged accessories. When the equipment is uncrated and located in its operating position, it only requires power and signal connections to be ready for operation; plus connection of some accessories. Instructions for making these connections are given in the following paragraphs. Dimensions of the standard console models are given in figure 6.

RACK (OR CUSTOM) MOUNTING

For rack mounting or custom installations, the equipment and interconnecting cables are shipped as separate items ready for installation into a 19-inch equipment rack. Figure 7 gives the outline dimensions. Figure 8 illustrates a typical rack mounting installation. Cable connections and signal interface information is presented in the following paragraphs of this section.

The electronics assemblies and transport are packaged according to commercial practices. In addition, the transport is contained in a wooden shipping crate. To remove the transport from the wooden shipping crate, pry the top of the crate off. (It is nailed on.) There are cutouts at each end of the crate so that the transport can be grasped and lifted out.

Remove the tape transport from its shipping crate and install it as follows :

1. Position the capstan assist spring for vertical or horizontal mounting, as required. See figure 10.
2. To expose the transport mounting rails, it is necessary to remove the transport front cover plate. This is secured by two screws at the top of the transport and a lip at the bottom. Remove the two screws and slide the cover from the lip.
3. Attach the transport to the mounting rails, using eight 10-32 screws, washers, and lock washers; four on each side.
4. Reinstall the transport front cover plate.

The maximum distance between the transport and the electronics assembly is determined by the control and head cable lengths. From the transport connector to the first electronics assembly connector is 36 inches. The remaining connector loops are 12 inches apart. The head cable set is 66-inches long.

To install the electronics assembly, open the front cover and attach to the mounting rails with four 10-32 screws, washers, and lock washers. When the electronics assembly and transport are installed, make the cable connections as shown in figure 10, and listed under "Electrical Connections."

NOTE

Note that each of the cards in the electronics assembly has a number on it indicating the channel. This should be considered when arranging the electronics assemblies.

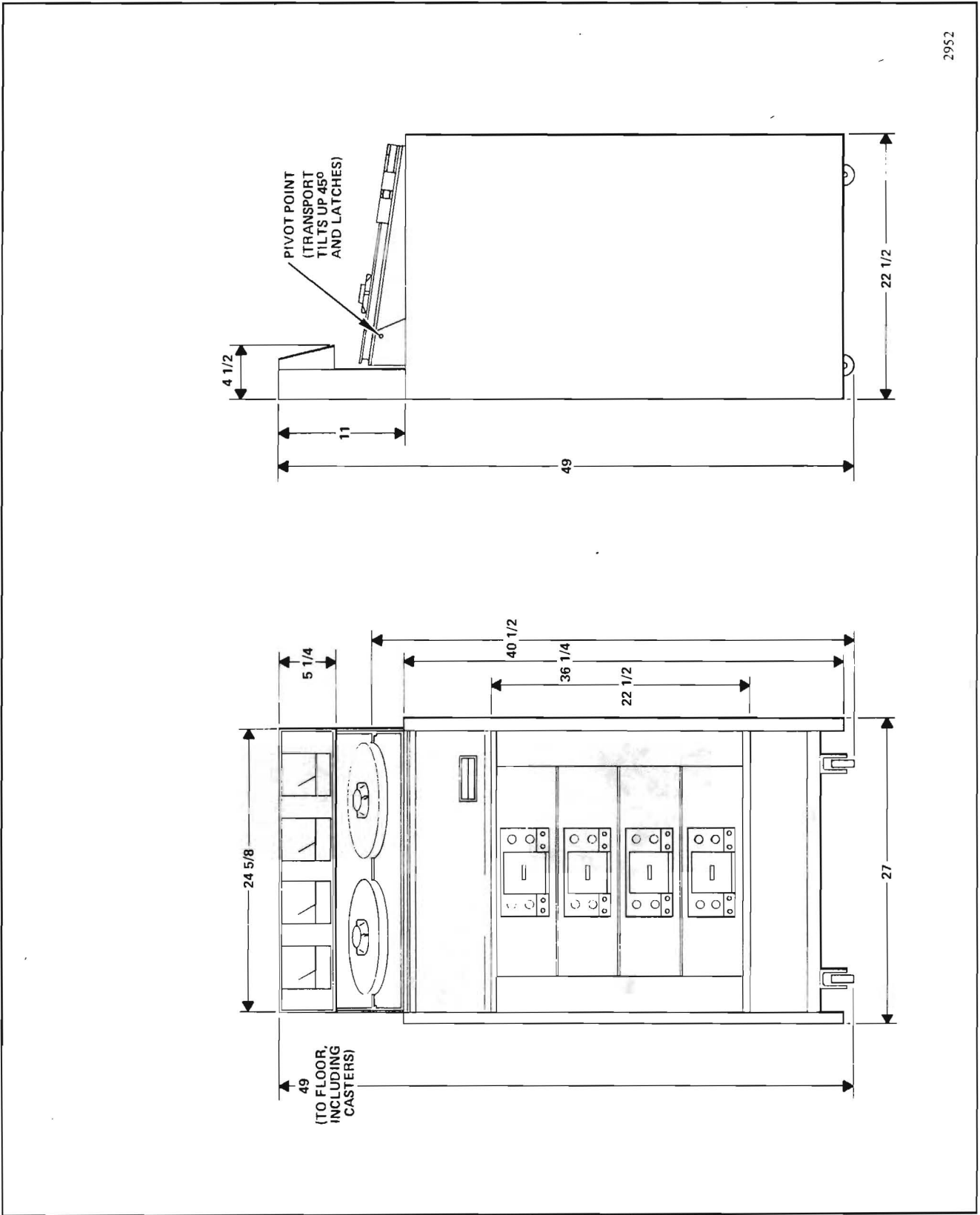
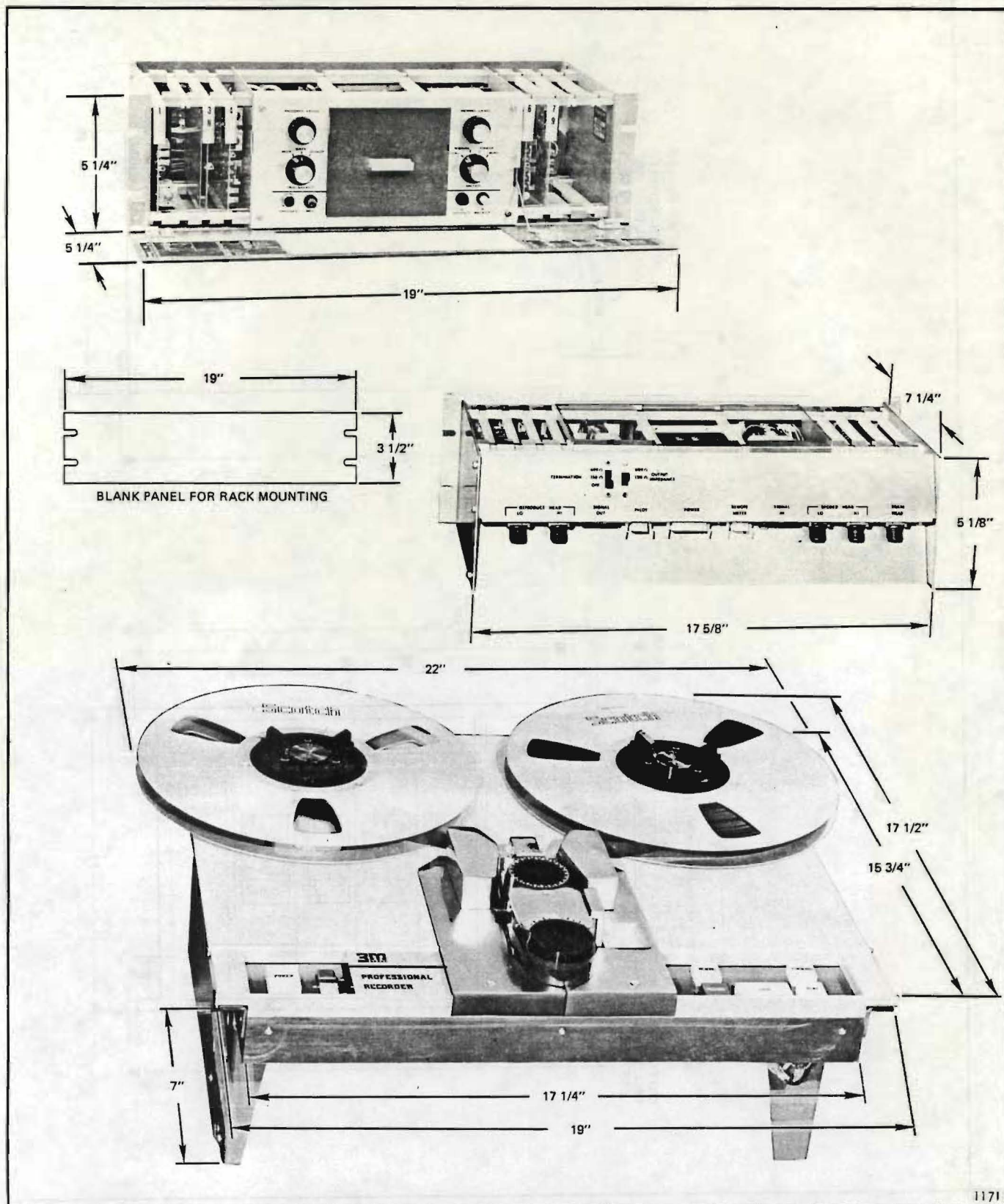


Figure 6. Outline Dimensions, Console Models



1171

Figure 7. Outline Dimensions for Rack Mounting and Custom Installations

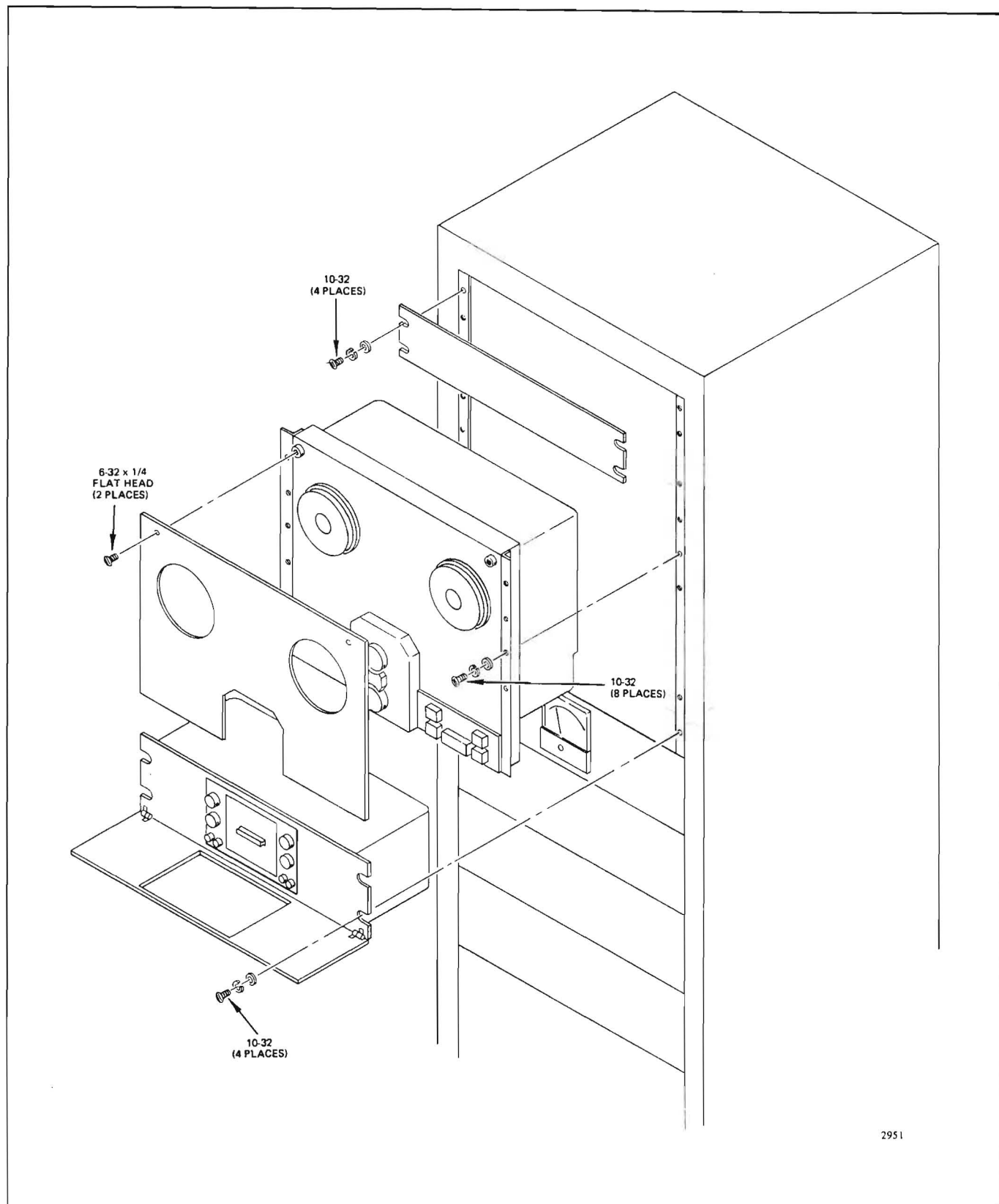


Figure 8. Typical Rack Mounting Layout

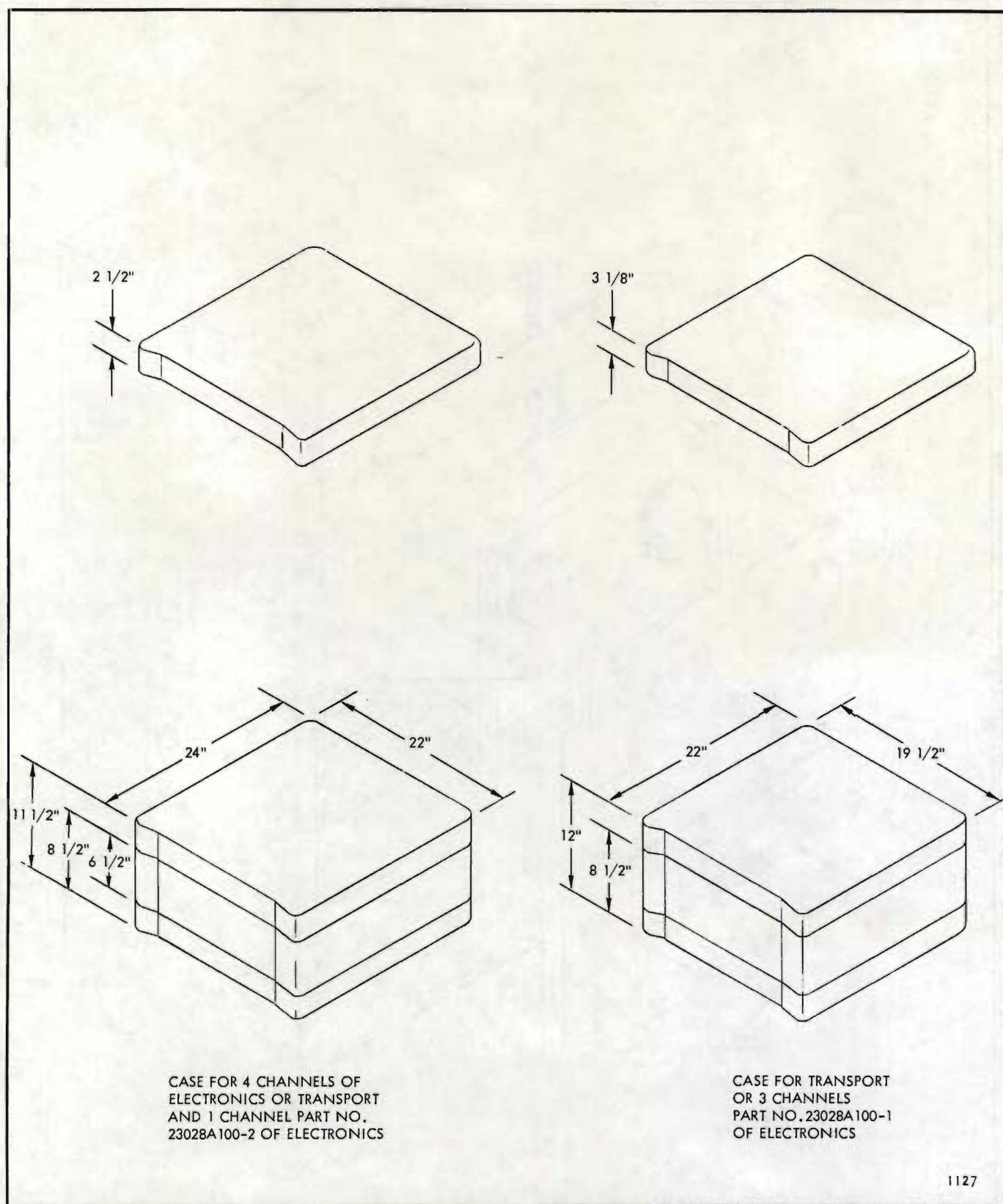


Figure 9. Transporter Case Outline Dimensions

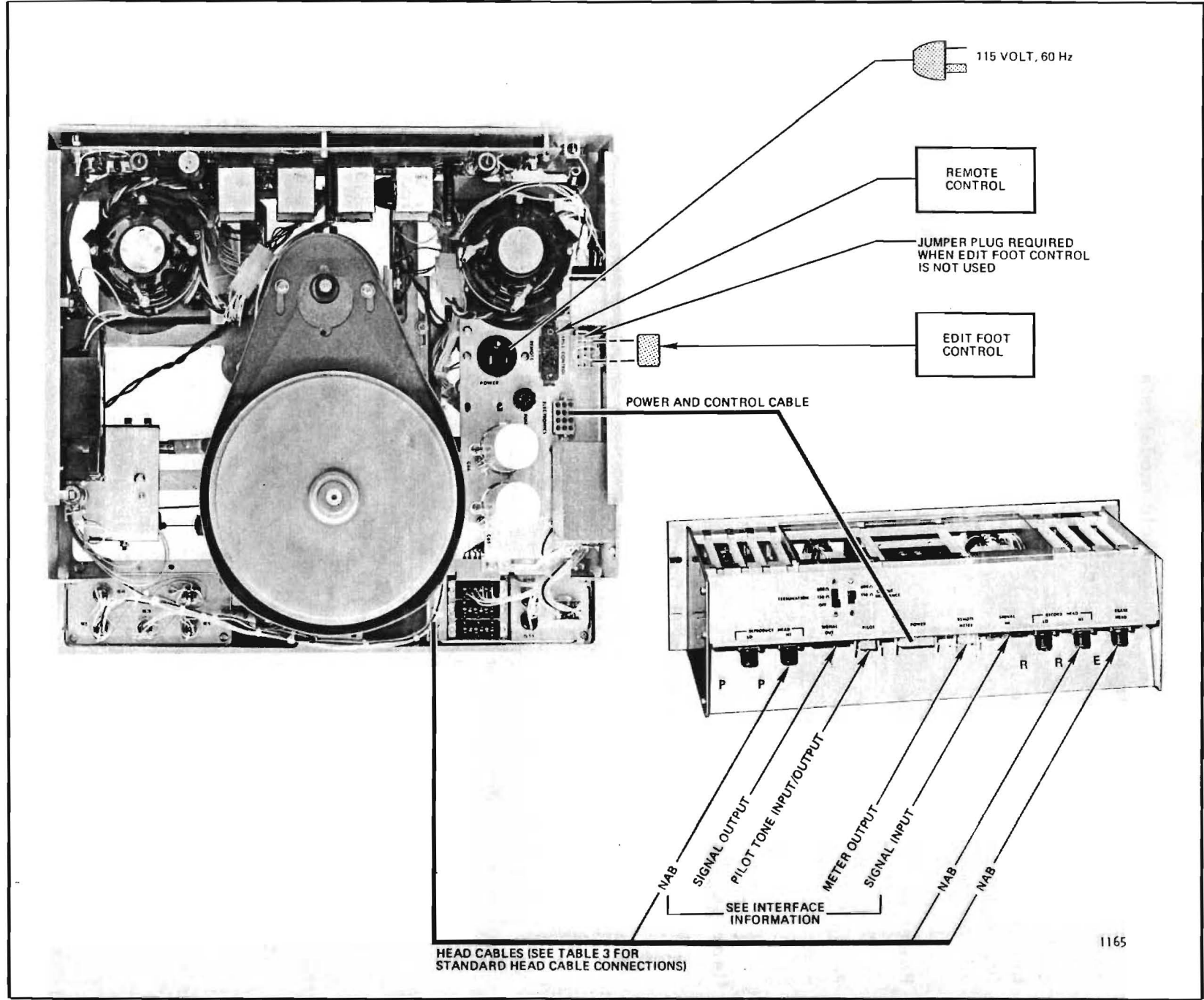


Figure 10. Cable Connections

M64 PAR 2-71

ELECTRICAL CONNECTIONS

As previously stated, the console model is shipped with all internal cabling connected. It only requires that the power cable and the external signal cables be connected, plus accessories such as the edit foot control and remote control. In addition, the rack mounting model requires connection of the power and control cable, and head cables between the transport and electronics assemblies. All of the cable connections are illustrated in figure 10, and each is detailed in the following paragraphs. Disregard any connection that does not apply to your equipment.

Power and Control Cable

Connect the power and control cable, 23028A050, to the ELECTRONICS receptacle on the tape transport and to the POWER receptacle on each of the electronics assemblies. It is not necessary that all connector loops of the cable be connected. There will be two extra connectors on this cable.

Head Cables

If the tape transport is shipped with magnetic heads already installed, the head cable connector will probably be installed on the transport. If it is not, the end of the head cable with the single connector and bracket must be installed in its proper position on the transport. The head connector is located in a recess to the left of the capstan as viewed from above. Orient the cable connector properly and install it by securing it with two No. 4 screws, washers, and lock washer. By attaching this cable to the transport, the head assembly can be removed and installed from above without disturbing the head cable connector.

For tapes recorded on one recorder to be compatible with tapes recorded on other recorders, the head cables must be connected to the electronics assembly as shown in table 2. Head cables marked with a P are from the play heads, and must be connected to the REPRODUCE HEAD connectors for the channels indicated. Head cables marked with an R are from the record heads and must be connected to the RECORD HEAD connectors for the channel indicated. Cables marked with an E are from the erase head and must be connected to the ERASE HEAD connectors for the channels indicated.

Signal Connectors

Connect the input and output connectors for each channel to the SIGNAL IN and SIGNAL OUT connectors. These are standard 3-wire XL type connectors. Interface information is given under that heading in this section.

Pilot Tone

If a pilot tone is to be used, make this connection to the PILOT connector. Refer to the interface information for the pilot tone under that heading in this section.

Table 2. Standard NAB Head and Signal Cable Connections

FOR CHANNEL	USE ELECTRONICS ASSEMBLY NO.	REPRODUCE HEAD		SIGNAL OUT	PILOT	POWER	REMOTE METER	SIGNAL IN	RECORD HEAD		ERASE HEAD
		LO	HI						LO	HI	
1	1			P1	CH 1 OUT			CH 1 IN		R1	E1
2	2			P2	CH 2 OUT			CH 2 IN		R2	E2
3	3			P3	CH 3 OUT			CH 3 IN		R3	E3
4	4			P4	CH 4 OUT			CH 4 IN		R4	E4

M64 PAR 2-71

Remote Control

If a remote control unit is to be used, connect the connector from the remote control to the REMOTE connector on the tape transport.

Edit Foot Control

If an edit foot control is used, connect it to the SPILL CONTROL connector on the tape transport. It is necessary to remove a jumper plug to make this connection. Do not misplace the jumper plug, since the machine will be inoperative without it if the edit foot control is later disconnected.

Power Cord

Pull back the shipping restraint latch from the power receptacle and plug the power cord into the tape transport. Then connect the other end of the power cord to a 115-volt, 60 Hz or 50 Hz power source.

INTERFACE INFORMATION

All input and output connections and circuitry of the Professional Audio Tape Recorder are based on standard operating procedures in the recording industry. Standard 3-wire XL type connectors are used for the signal inputs and outputs. Cables should be made up in conformance to standard practice as to length, shielding, etc., with connections as in the following paragraphs.

Signal Input

To bridge a balanced studio line, connect the line to pins 2 and 3 of an XL male plug (figure 11) and insert it into the SIGNAL IN socket. Connect the ground to pin 1. Input level of -10 to +8 dBm based on the signal level in a 600-ohm line may be employed as a signal source. The load is approximately 20,000 ohms.

An unbalanced line source should be connected to pins 2 and 3 of the connector. Ground should be connected to pins 1 and 2. See figure 11. This provides a 20,000-ohm bridging input for signal levels as above. Pin 3 could be grounded rather than 2 without degradation of performance, but pin 2 is suggested as first choice in the interest of consistency.

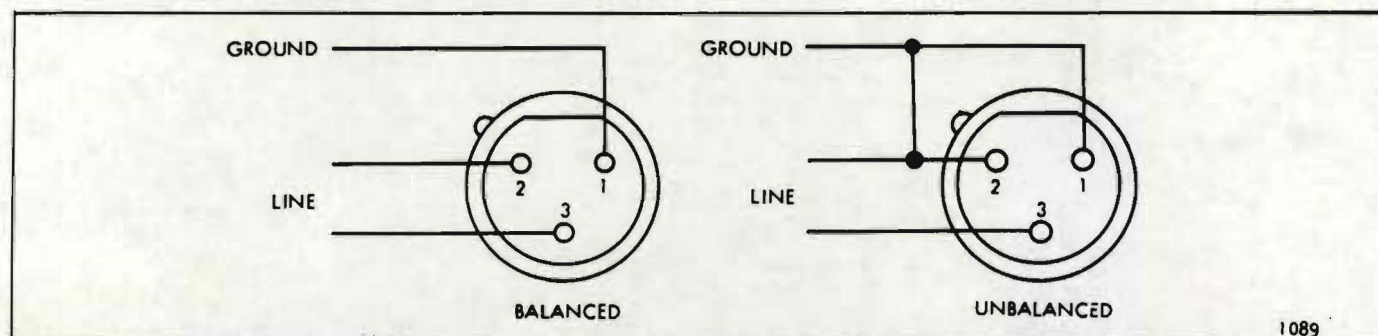


Figure 11. Signal Input Connector Wiring

Signal Output

The output signal for connection to line facilities is to be fed from the male SIGNAL OUT connector to an XL type female connector on the outgoing cable. Use pins 2 and 3 for the signal output with pin 1 as ground. See figure 12. A balanced line may be fed from 2 and 3, or an unbalanced line may be fed by grounding either 2 or 3. In the interest of consistency, it is suggested that 2 be employed as ground and 3 as the signal lead.

Two switches are provided on the rear panel of the electronics just above the SIGNAL OUT connector. The OUTPUT IMPEDANCE switch provides for selection of 150 or 600 ohms output line impedance and the TERMINATION switch provides for proper terminating impedances for either 150 or 600 ohms, if needed. If the outgoing line is properly terminated elsewhere, set this switch to the OFF position.

Note that the positions of these switches will affect the reading of the VU meter as much as 2 dB. This meter is normally calibrated to read the proper levels in a +4 dBm 600-ohm line. It may be recalibrated by adjusting resistors in the line amplifier board. A chart of values for the selectable resistors is given under the discussion of this board in the Functional Description.

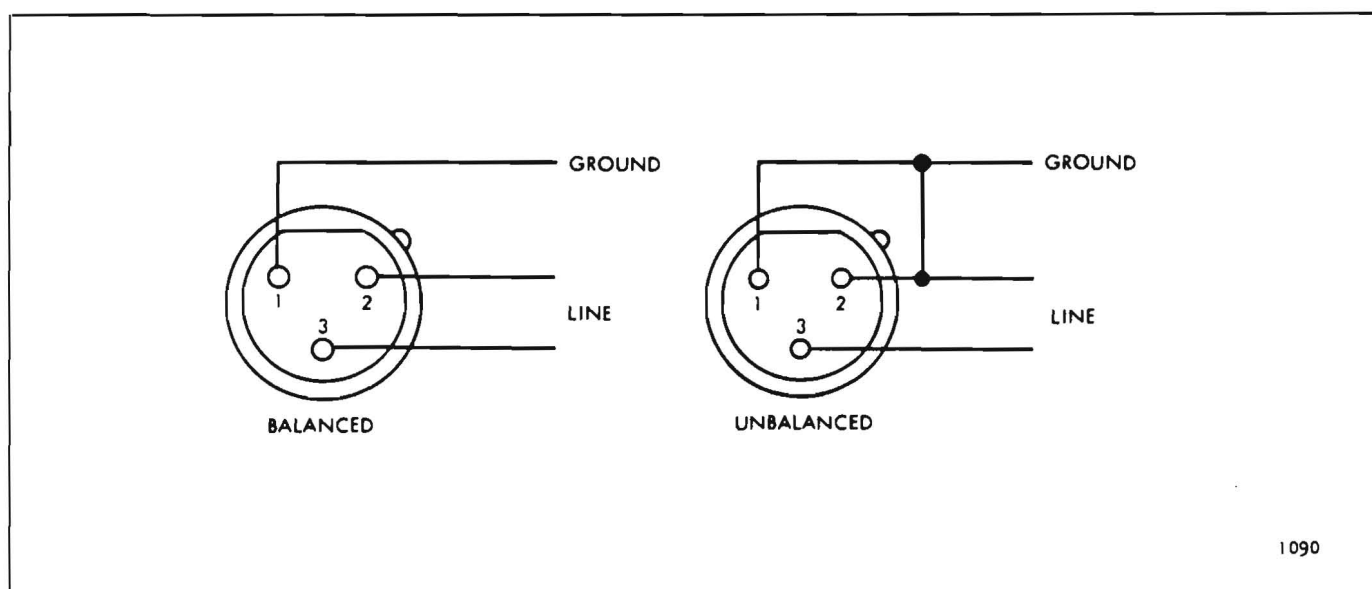


Figure 12. Signal Output Connector Wiring

Remote Meter

The VU meter is connected to pins 1 and 4 of this connector. The lamps for the meter are connected to pins 3 and 6.

Pilot and Loudspeaker.

This connector is provided to permit insertion of a reference tone, sub-sonic or supersonic, onto the track being recorded and to permit extraction of the tone on playback without having the level of either the recorded or reproduced pilot effected by adjustment of the front panel record or playback gain controls. The pilot tone to be recorded is applied at pin 1 with grounded return on 4. The reproduced pilot is on 2 with grounded return on 5. See figure 13.

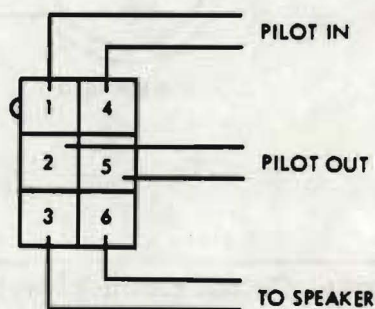
This connector is also used to provide signal to an external monitor loudspeaker if desired. The speaker is to be connected to pins 3 and 6, and will operate at reasonable monitoring volume level when the VU is set up for +4 dBm lines. It will be 4 dB louder when the VU is set for +8 dBm lines and so on. A simple attenuator may be installed on the speaker to reduce its volume.

Phones

Monitor earphones may be plugged into the PHONES jack on the front panel. High impedance phones are to be used. Neither side of the circuit is to be grounded. The phones will monitor either the input or tape playback, the same as the VU meter, which is the signal being fed to the output line.

CAUTION

A ground on either earphone lead will upset the characteristics of the line amplifier so that it will feed improper level to the meter and line and may go into oscillation.



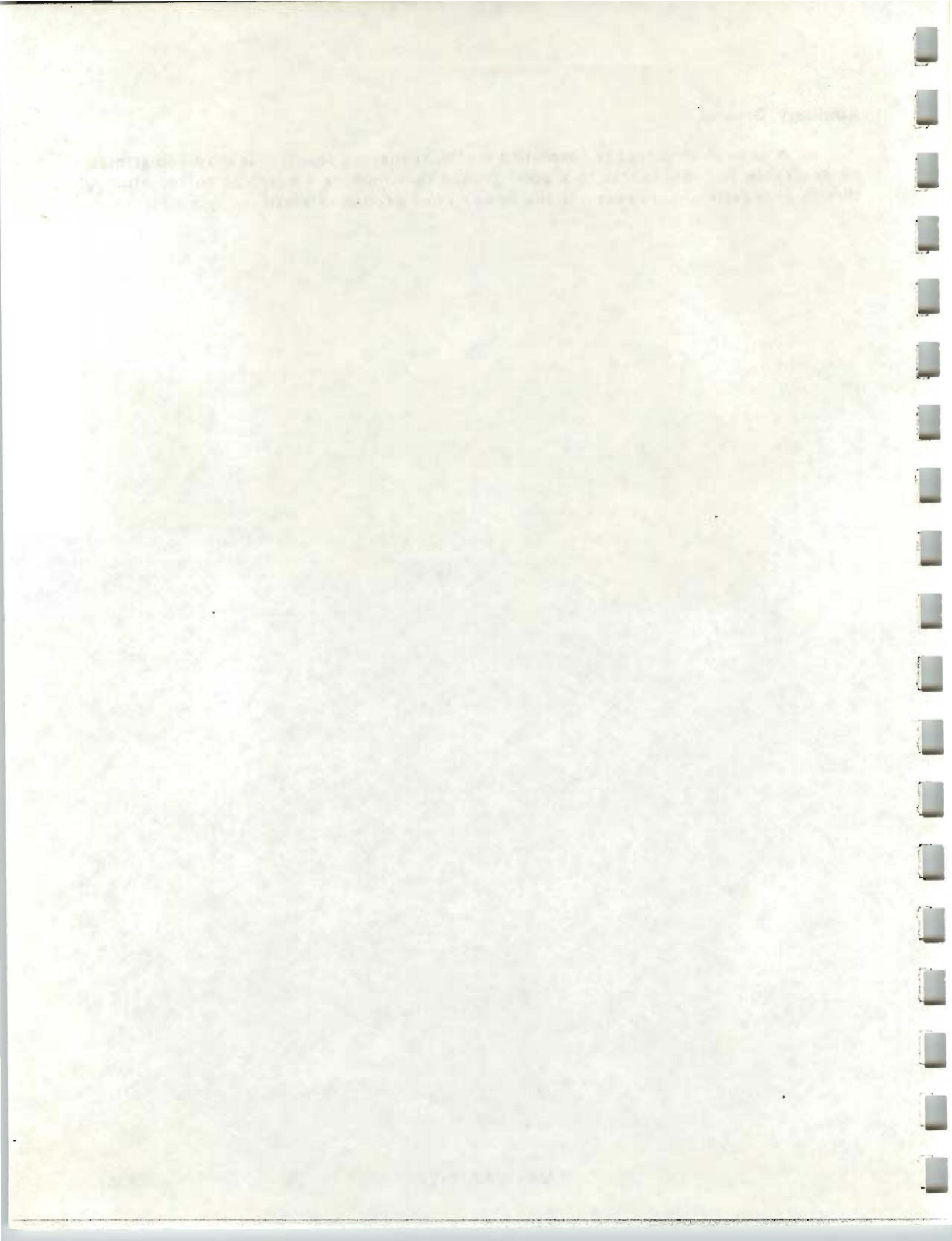
1091

Figure 13. Pilot Connector Wiring

A ground terminal is furnished on the transport frame. It may sometimes be desirable to connect this to a good ground to minimize electrical noise, although this is generally unnecessary if the power cord ground is sufficiently noise-free.

Auxiliary Ground

A ground terminal is furnished on the transport frame. It may sometimes be desirable to connect this to a good ground to minimize electrical noise, although this is generally unnecessary if the power cord ground is sufficiently noise-free.



OPERATING CONTROLS AND DETAILS

In this section are considered all controls which are directly accessible from the top surface of the transport and from the front surface of the electronic assemblies. Internal adjustments to be made with screwdriver or wrench are discussed in the Alignment and Adjustment section.

TAPE TRANSPORT CONTROLS

The normal operating controls are located in the lower right-hand corner of the transport. See figure 4. These five illuminated pushbuttons control all tape movement through a system of safety interlock relays that prevent malfunction because of improper operation. Any button can be pushed in any sequence, at any time, with complete safety to the tape and machine.

PLAY Button

This causes the transport to move the tape at normal forward or record speed under capstan speed control. The transport can be placed in PLAY at any time from any tape mode. For recording, both the PLAY and RECORD buttons must be pushed simultaneously when tape is either at standstill or in the normal forward, play mode.

FORWARD Button

Activates the high speed tape advance in the forward direction. The fast forward mode may be initiated without pressing the STOP button. In fast forward, the tape lifters are activated and the head shield opens. The tape lifters may be manually overridden to allow tape to be heard. When the STOP button is operated from this mode, dynamic braking is used to stop tape, then a slight holding torque is applied to maintain tape tension.

NOTE

Magnetically operated reed switches, operated from a direction sensitive vane under the takeup reel turntable, control the dynamic braking and electrical switching when the transport is taken out of FORWARD or REWIND mode. This vane is a sensor to determine the direction the tape is traveling. The appropriate reed switch then activates relay control circuits which place the transport in either FAST, FORWARD, or REWIND, preliminary to the STOP mode, depending upon the original direction.

STOP Button

This button stops all tape motion from any mode of operation. It also indicates when the transport is ready for operation. It is illuminated when the transport power is on and tape is threaded in the tape path. Without tape in the tape path, the unit will not operate and this button will not be lit. When the STOP button is activated while tape is in the high speed mode, dynamic braking is applied until the tape stops. Then, the transport goes into the STOP mode and a light holding torque is applied by both motors to maintain tape tension.

REWIND Button

Tape may be put into high speed rewind from any other mode of operation, even from fast forward, without danger of tape breakage. Tape lifters on both heads operate during high speed rewind and the headshield opens. The tape lifters may be manually overridden if you want to hear the tape.

RECORD Button

This button connects the recording circuits to the record head. To operate, the button must be pushed at the same time as the PLAY button is pushed. This must be done when tape is either at standstill or running in PLAY mode. Stopping the tape, or changing the tape mode of operation, automatically deactivates the recording circuits; and the RECORD and PLAY buttons must be pushed again to resume recording. To complete the recording circuit, the recording amplifier switch on the applicable electronic assemblies must be in RDY. position.

The remaining controls are mounted in the lower left-hand of the transport.

POWER Switch

AC power to the entire recorder is controlled by this switch.

NOTE

The tape transport will not be energized and the STOP button will not light until tape is threaded into the tape path.

CAUTION

Do not turn the power off when the transport is in a fast tape travel mode (REWIND or FORWARD). This could throw a tape loop because the dynamic braking will not operate.

A-B OUTPUT Transfer Switch

This pair of pushbuttons provides for simultaneous transfer of the signal outputs of each electronics assembly from the input line to tape playback, or vice versa. The A button sets all channels to monitor the input signal. The B button transfers monitoring of all channels to the output signal.

RUNOUT Switch

The runout switch is not operational on this recorder. Switch can be set to any of the three positions.

SPEED Switch

The SPEED switch selects either of the two speeds at which the machine operates. These are 7 1/2 and 15 ips, or 15 and 30 ips.

CAUTION

This switch should not be operated with the capstan motor running. Power must be off or tape not threaded.

BALANCE Switch

This 3-position switch changes motor torque factors to compensate for reels of different weight and/or size. When both reels are identical, the switch remains in the middle, or BALANCED position. If the left reel is larger or heavier, the switch should be in the left position. If the right reel is larger or heavier, place the switch in the right position.

TAPE TRANSPORT, TAPE HANDLING COMPONENTS

The following tape components are in the capstan handling assembly area. See figure 14.

Reversing Idler

Tape is threaded around this free-wheeling idler, which helps provide an extremely short path of unsupported tape. Ridges in the idler provide for air passage during high-speed tape movement, so that the tape hugs the idler.

Head Assembly

All head stacks, erase, record and play, are mounted on a single plug-in precision plate which is mounted on the transport casting beneath this head cover. The trim plates must be removed in order to remove the head assembly.

Azimuth of record and playback heads may be adjusted by removing the head cover plate located between the capstan and reversing idler.

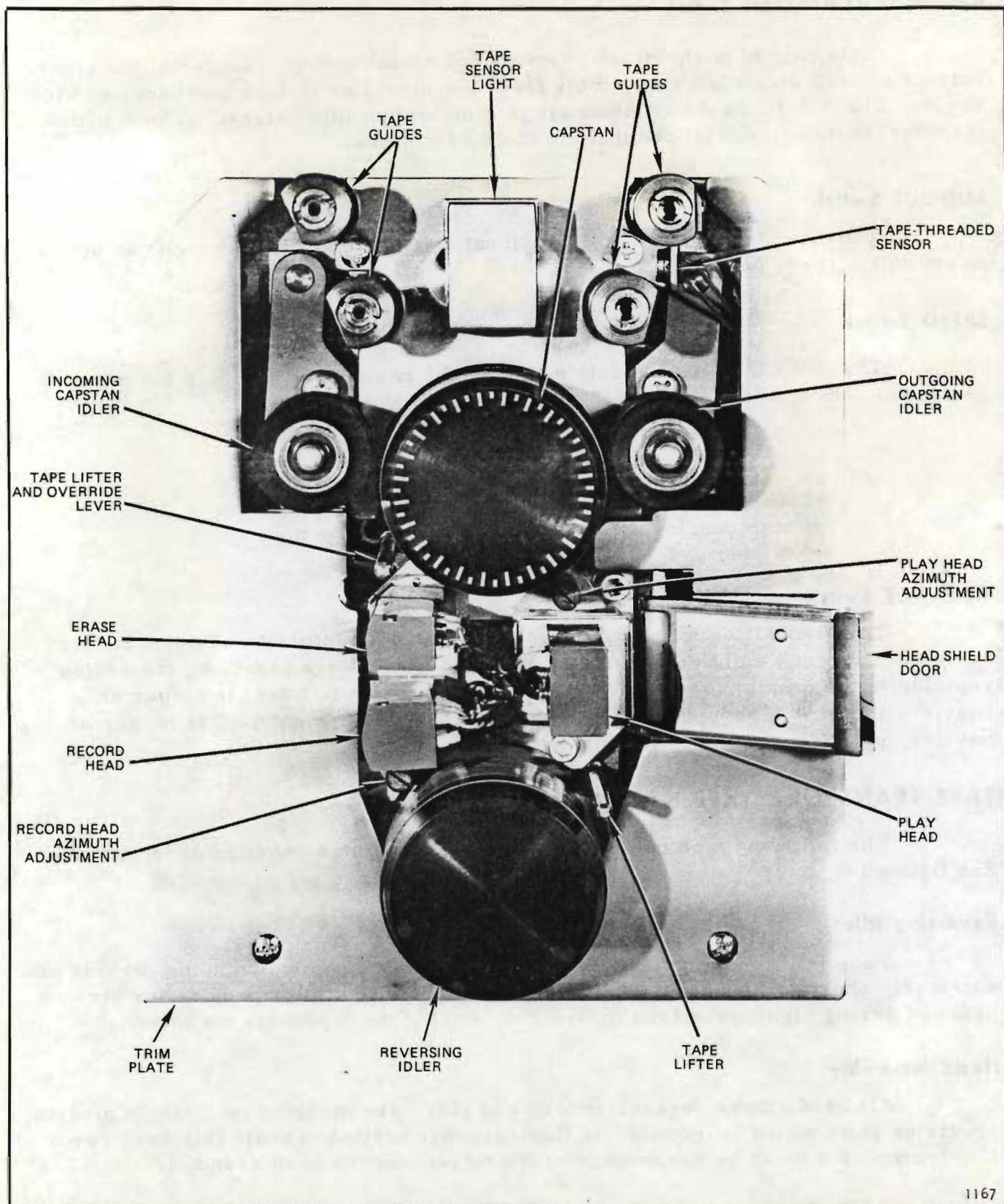


Figure 14. Tape Drive Components

Tape Lifters

The tape lifters automatically move tape away from heads during high-speed tape travel to reduce head wear and cut chatter. They are electrically interlocked with the playback head shield door so that the latter opens to make room for the tape when lifters move it away from heads.

The tape lifter may be manually overridden by pressing the tape lifter and override lever. This restores the tape against the head so that it may be heard.

Head Shield Door

The head shield door provides for hum reduction and automatically drops away from head during high-speed tape travel and whenever tape is lifted from tape path. This allows easy removal of tape for editing, etc.

Capstan

The differential capstan is the basis of the patented Isoloop system for transporting tape with extremely low flutter and wow. Its function and operation is described in the General Description Section.

Capstan Idler (Incoming)

This idler is designed to clamp the tape to the smaller diameter parts of the capstan. The capstan thereby unwinds tape from the supply reel and feeds it into the loop. In starting, this idler moves in slowly after initial contact so as to gently accelerate the tape to running speed. Only after tape has had sufficient time to get up to speed does the outgoing idler function.

Capstan Idler (Outgoing)

This idler pulls the tape through the head assembly at a slightly higher rate than the tape is fed in because it presses the tape to the capstan at its larger diameters. This maintains a constant tape tension across both heads, but the tension does not exceed the stretch capabilities of the tape. It is moved into position directly without retardation of dashpot as provided on the incoming idler.

Tape-Threaded Sensor

This photoelectric circuit across the tape path provides both convenience and safety. Whenever the tape breaks the light beam, a slight holding torque is applied to the reels to maintain tape tension. When there is no tape in the path, the reel motors are deenergized, the tape turntables are free-wheeling, the head cover opens, and all pushbuttons are deactivated. This allows for easy removal of the tape for splicing. Also, when the end of the tape is reached, the motors stop quickly, minimizing tape whip-around.

Reel Holders

Standard reel holders are supplied for holding down 10-1/2 inch NAB reels. Rotating the upper portion of the holder, when a reel is in place, locks the reel on. This is useful when the machine is mounted vertically. Locking is not necessary when transport is horizontal or at a slight angle. Removal of the large center screw permits changing to different hub types. Only 1/4-inch systems are supplied with NAB reel holders, which can be removed by rotating the center post. When the NAB holder is removed, the center post will accommodate the small plastic cinema reels.

ELECTRONICS ASSEMBLIES

Electronic controls, except for the record control, are located on the electronics assembly for each channel. These controls are shown in figure 15 and their description follows.

RECORD LEVEL Control

This adjusts the signal level recorded on the tape. It may be adjusted through a line input level range of -20 dBm to +8 dBm (600 ohm line). To monitor the signal audibly, or to read the level of the incoming line, the METER switch is set to SIGNAL and the OUTPUT SELECT set to A. After the level is properly adjusted, the knob may be locked by turning the ring behind it in a clockwise direction.

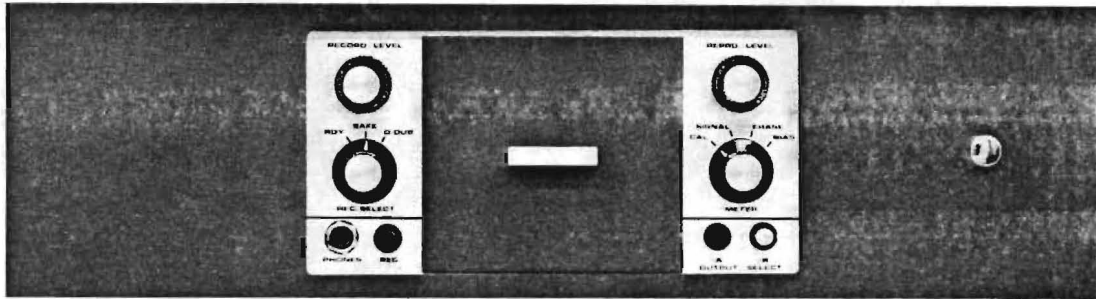
REPRO. LEVEL Control

This adjusts the playback gain. It is a locking control. It is not necessary to calibrate a level setting for this control by employing a standard tape and then locking the control in place. This is because the METER switch has a calibrate (CAL) position which substitutes a fixed pad for the REPRO. LEVEL variable gain control whenever it is desired to calibrate levels. The REPRO. LEVEL control is only in the normal tape playback path. The OUTPUT SELECT button B must be pressed to transfer the meter and output line to the playback circuit.

REC. SELECT Switch

This has three positions affecting only the record circuits.

1. RDY. In this position, the circuits for the particular channel are ready to record. If the RECORD and the PLAY buttons on the transport or its remote control unit are pressed simultaneously, the record circuits will be activated and the red REC. lamp will light. The eraser and the record head for this track will be activated.
2. SAFE. In this position, the erase and record circuits will be locked off so that accidental erasure or damage to a previously recorded tape will not occur should the record mode be selected at the transport or remote control.



2953

Figure 15. Electronic Controls

3. O. DUB. This is the overdub position. This prevents the record and erase circuits from being energized and substitutes the record head in place of the normal playback head for this track. In the overdub position, a performer can listen to a previously recorded track while adding a new part in perfect synchronism on another track. This is because the signal he is hearing is being played from a record head in the same stack as the head he is using to add the new recording. There is thus no time separation between the two.

METER Switch

This switch has four positions affecting the function of the meter and influencing the signal output level.

1. CAL. This is a calibrate position. When it is selected, the REPRO. LEVEL gain control is removed from the playback amplifier and a fixed attenuator is substituted. Thus, a known overall gain can always be checked as a reference. An adjustable gain control in the pre-amplifier is set to give proper meter level readings from a standard reference tape.

The switch may then be set to the SIGNAL position where the variable REPRO. LEVEL control permits operating playback gain adjustments, as necessary.

2. **SIGNAL.** In this position, the meter monitors either the input signal, A, or the playback signal, B, depending on which OUTPUT SELECT indicator is lit, A or B. Similarly, the signal fed to the outgoing line (SIGNAL OUT) is either A or B.
3. **ERASE.** In this position, the meter shows a steady deflection, depending upon the magnitude of the high frequency current in the erase head. The output signal to the line remains under the control of the A-B OUTPUT SIGNAL switches the same as described above under SIGNAL.
4. **BIAS.** In this position, the meter reads the magnitude of high frequency bias current.

OUTPUT SELECT Switches

These consists of the illuminated A-B buttons mentioned above. Whenever the METER switch is in any position other than CAL., these buttons determine the source of signal to be fed to the outgoing line (SIGNAL OUT connector). When the A button is pressed and the A lamp lights, the input signal is being monitored and is the signal output. When the B button is pressed and the B lamp lights, the outgoing signal is then connected to the playback circuits to monitor the signal reproduced from tape. The A-B transfer buttons on the transport can switch all channels at the same time, but individual channels remain under control of their A-B buttons.

A small slide switch on the Line Amplifier circuit board will inactivate the automatic A-B transfer, if desired. When inactive, the transfer is solely under control of the A-B buttons on the particular electronics assembly.

REC. Indicator

This is a recording indicator lamp to show when the record and erase circuits are energized. It is under control of the RECORD button on the transport but may be locked out of service by placing the REC.SELECT switch in either the SAFE or O. DUB position rather than its normal RDY. position.

PHONES Jack

This jack is provided to drive a high impedance earphone, which bridges across the output signal line. Since this is usually operated as a balanced circuit, neither side of these phone may be grounded.

This description of the controls on the electronics module covers all controls and indicators normally referred to in the course of operating the recorder. The front cover door hinges down to reveal a series of plug-in electronics boards which contain a number of screwdriver adjustable components. These are normally not adjusted by operating personnel. Maintenance personnel employ them to trim a machine into peak performance. They are referred to under Alignment and Adjustment, Routine Maintenance, and Circuit Descriptions.

GENERAL OPERATING PROCEDURES

PRELIMINARY

Slide the plate (see figure 4) covering the slide switches to the left so that it covers the POWER switch and reveals the three slide switches. Set the SPEED switch to either HIGH or LOW as desired. The RUNOUT switch may be set to any position. Identical large reels should be used on both reel spindles. If this is done, set the BALANCE switch to its mid-position. Slide the switch cover to the right, revealing the POWER switch and A-B OUTPUT buttons.

THREADING

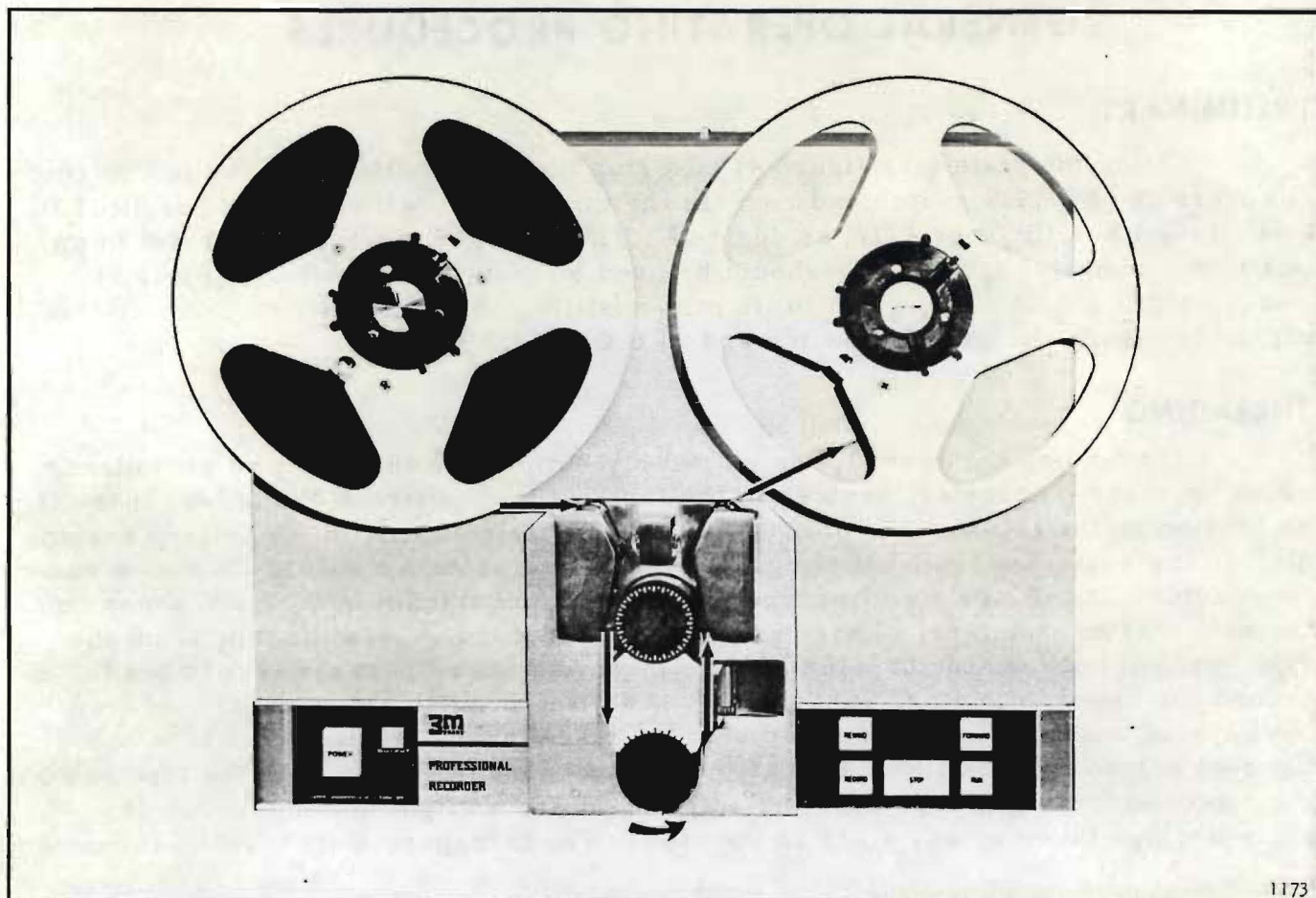
Threading the recorder is extremely simple, as there are no compliance arms or other mechanical devices in the tape path. See figure 16. Also, there is no tension on the tape until it breaks the photoelectric circuit in the Isoloop assembly, so the reels are free-wheeling. To thread, first push the POWER button to turn the machine on. Place a roll of tape on the left hand spindle in such a manner that the reel rotates counterclockwise when tape is unwound. Take the tape from the reel, drop it between the capstan and the incoming idler, past the record head, around the reversing idler, past the play head (the head shield is open), between the capstan and outgoing idler, then onto the take-up reel. Thread the tape onto the reel hub so that it will wind in a counterclockwise direction. As the tape breaks the photoelectric light path after the outgoing idler, a slight holding torque is applied which takes up any slack in the tape. The transport is now ready to operate.

Observe that the control buttons function in the manner intended and that they are each illuminated in their operating mode. Observe that the playback head cover door closes when the machine is started in the play or record mode and that it opens when the tape lifters raise tape off the heads in fast forward or rewind modes. Observe that in standby with tape threaded in place, the head cover door will remain either open or closed when operated manually. Observe that this door, if closed in standby, will open if tape is lifted from its running path at the right hand guiding system prior to reaching the take-up reel.

MONITORING

All electronics assembly adjustments described in the following paragraphs are for a single recording channel. In multichannel operation, perform the procedure for each channel of electronics.

Signals to be recorded and reproduced can be monitored by: (1) the VU meter on the display panel, (2) an earphone (high impedance, ungrounded) plugged into the PHONES jack, (3) a loudspeaker connected directly to the PILOT connector at the rear of the electronics assembly (terminals 3 and 6), or (4) from the signal output connector on the rear panel.



1173

Figure 16. Tape Threading

To monitor the recorder input signal, set the METER switch to SIGNAL and press OUTPUT SELECT button A. The signal amplitude will be under control of the RECORD LEVEL knob.

To monitor signals reproduced from recorded tape press the OUTPUT SELECT button B. The REC. SELECT switch should be in either RDY. or SAFE positions. With the METER switch in the SIGNAL position, the REPRO. LEVEL knob will determine the loudness of the monitored signal.

To determine the true magnitude of signal level on the tape, place the METER switch in the CAL. position. The loudness and meter reading are then determined by a fixed calibrated amplifier gain rather than the variable REPRO. LEVEL control. The A-B OUTPUT transfer buttons on the tape transport can switch all channels of a multichannel system at the same time.

RECORDING

Set the RECORD LEVEL knob and the REPRO. LEVEL knob to minimum (fully counterclockwise).

Set the REC. SELECT switch in the RDY. position. New, degaussed, or previously recorded tape may be used.

Set the METER switch to the SIGNAL position.

Press the OUTPUT SELECT button A.

Slowly increase the RECORD LEVEL control until the meter peaks at +2 VU on the loudest peaks on input program material. The signal should be clearly heard in the monitor system. Have the program source cut off by fade or switching. Listen for acceptability of residual noise, particularly low frequency hum. For truly critical applications, for which this machine is designed, a vacuum tube voltmeter should be used to determine residual circuit noise. Recorder-contributed noise in this test will generally be well below external circuit noise. Have the program feed restored at the former level.

To start recording, simultaneously press the PLAY and RECORD buttons on the tape transport. These two buttons should light and the red REC. indicator on the electronics panel should also light.

Press OUTPUT SELECT button B. Slowly increase the REPRO. LEVEL control until the signal is audibly and visually the same loudness as the input signal. This can be easily determined by alternately pressing the A and B buttons. Listen critically on a good monitor speaker system to be certain the signals sound identical in either the A or B position after their levels are set as closely the same as possible.

Cut off the input signal and listen for noise. No increase in hum should be observed in the B position when compared to the A position. Tape noise should be the only additional source of noise observable in playback. Noise measurements are outlined under Alignment and Adjustment.

Press the STOP button. The tape should stop. The REC. indicator should go out.

If A-B transfer from the transport is not wanted, open the front panel cover of the electronics assembly, and position the upper slide switch on the line amplifier board in slot 6 in the OFF position. A-B switching is then solely under control of the A-B buttons on the electronics panel.

PLAYBACK

Playback is accomplished simply by pressing the PLAY button on the tape transport. The B output must be selected.

When the recorder is used for reproducing a previously recorded tape, it is wise to set the REC. SELECT switch in the SAFE position. Should the RECORD and PLAY buttons be pressed simultaneously in error, the recording circuits will still be locked out and the tape protected against accidental erasure.

OVERDUBBING

The overdub feature is provided on the playback preamplifier boards. It is controlled by the REC. SELECT switch.

It provides a means of adding a second audio track in synchronism with a first track. Board 7/9 is removed from slot 7 and installed in slot 9. After overdubbing operation, reinstall board 7/9 into slot 7 with power turned off.

Consider a two-track recorder as an example. We will call the channel numbers 1 and 2. An orchestra is recorded on track number 1 and it is desired to add a synchronized vocal in track number 2 which has been left unrecorded. If track number 1 is played into earphones for the singer's benefit in the normal way from the regular playback head, the singer's voice will be recorded on track 2 displaced on the tape from the orchestra recording by the linear distance from the playback head stack back to the record head stack. The two can therefore never be played in synchronism because of the scanning time differences which arise.

Therefore, it is necessary to play the orchestra track (No. 1) from the No. 1 record head, substituting it for the No. 1 playback head. The overdub preamplifier provides proper gain and equalization to accomplish this when the REC. SELECT switch is set to the O. DUB position. Furthermore, this position of the switch locks off its recording electronics as in the SAFE position so that the orchestra track may not be destroyed. The singer's track, No. 2 is left in the RDY. position and the recorder is started in the record mode. The singer then sings in synchronism with the orchestra and both tracks No. 1 and No. 2 are vertically oriented so that there is no time displacement between them. When the singer has finished recording his part, both tracks may be played back through the regular playback head assembly by placing both No. 1 and No. 2 REC. SELECT switches to SAFE.

ERASURE

Erasure is automatic, since the electronics module is constructed to feed two high-frequency circuits. One of these is the record head bias requirement and the other is the eraser. To take full advantage of the increased dynamic range and lower noise level provided by the 3M recorder, all recording should be done with new tape, or tape that has been very carefully bulk erased.

ALIGNMENT AND ADJUSTMENT

TAPE TRANSPORT

The tape transport has been factory aligned for peak performance. With use it will occasionally be necessary to undertake routine inspection of the machine and check certain adjustments. The following information provides a procedure for thorough check of the tape transport. After the user has followed this procedure a few times, it may be found that certain steps may be checked at less frequent intervals. Location of transport adjustments is shown in figures 17 and 18.

1. Remove the six screws that hold the transport cover plate in place and remove the cover plate. The bottom of the cover is held in place by a lip. No reels are to be on machine.
2. Connect the input power cord to the output of a 7-1/2 amp Variac set to zero volts.
3. Increase the Variac output voltage; at approximately 90 volts, relay K1 should be heard to operate, the POWER button should light, and the tape sensor light should come on. If this does not happen, press the POWER button.
4. Continue to increase the Variac voltage until its dial indicates 115 volts. All five function control buttons should be dark and no motors, including the fan, should be operating. The illumination level of the POWER button should not change.
5. Place a piece of opaque material in the tape path between the tape sensor light and the tape-threaded sensor. This will be referred to hereafter as the "tape sensor mask." The STOP button should light. The take-up motor should rotate at approximately 55 to 80 rpm in a counterclockwise direction. The rewind motor should rotate similarly in a clockwise direction.
6. Remove the tape sensor mask. The STOP button light should go out and all motors should stop.
7. Reinsert the tape sensor mask. Move the capstan motor SPEED switch to HIGH. Observe that it runs at high speed. Remove the tape sensor mask. Move the SPEED switch to LOW. Reinsert the tape sensor mask. Press the PLAY button. Observe that the capstan motor runs at half speed in the same direction. Remove the tape sensor mask. All motors should stop and the STOP button should not be lighted. Return the switch to the HIGH speed position. Reinsert the tape sensor mask. The STOP button should light and the reels should rotate slowly.

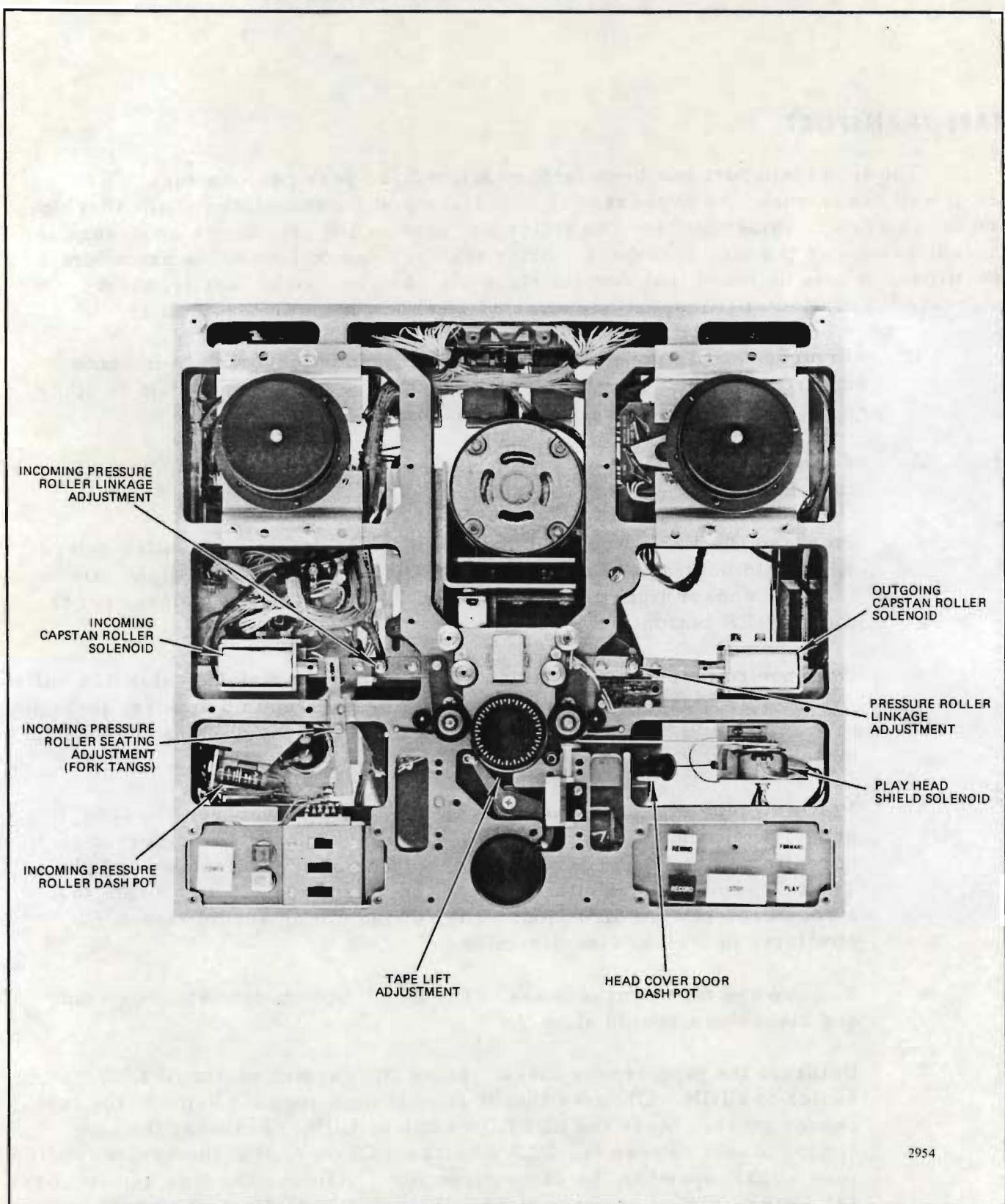


Figure 17. Tape Transport Adjustments, Top View

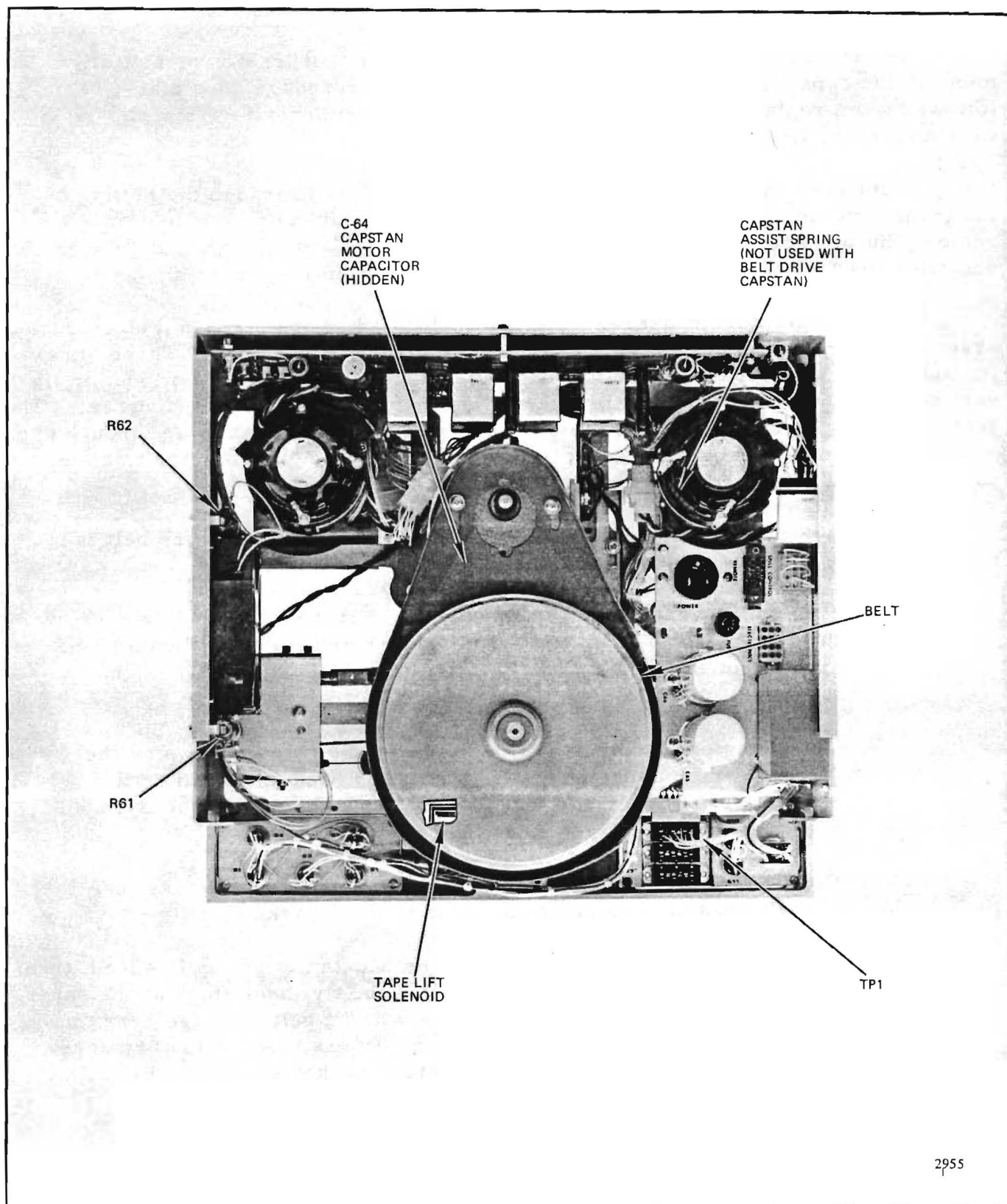


Figure 18. Tape Transport Adjustments, Bottom View

Capstan Belt Adjustment

Occasionally it may be necessary to adjust the belt tension or belt alignment on the capstan drive assembly. The following procedure should also be followed when replacing the belt or any of the drive components, i.e., capstan, capstan motor, flywheel, etc.

Access to the belt drive assembly is accomplished through the bottom of the transport, as shown in figure 18. To expose the belt inside the dust cover, remove the two screws on the front and the two screws at the rear of the cover, and slide the lower half of the cover down and away from the top section.

Five socket head capscrews, figure 19, located on the capstan motor bracket assembly, permit the adjustment of the belt alignment and tension. Three screws located on the motor base, when loosened, allow the motor to be positioned in the vertical plane so that the belt will ride at the top of the crown on the flywheel. The remaining two screws fasten the motor bracket to the transport frame through two slotted holes in the bracket. Loosening these screws allows the motor to be moved back and forth, which adjusts the tension on the belt.

The following procedure should be used when adjustment of the belt is necessary.

8. Spin the flywheel by hand and observe that the belt, as it passes over the crown of the flywheel, remains centered. There should be no skewing of the belt (up or down motion across the crown of the flywheel).
9. If skewing of the belt is noticed, loosen the three screws on the capstan motor base, and move the motor back and forth until a position is found which allows the belt to ride true on the flywheel without skewing. Tighten the three screws.
10. Position the SPEED switch for LOW ips operation, Press the POWER button, and insert the tape sensor mask.
11. Press the PLAY button and allow the capstan to get up to speed; then, press the STOP button. Observe that the flywheel stops at the same time the capstan motor pulley stops with no belt slippage over the motor pulley or flywheel. If slipping occurs, loosen the two screws through the slotted holes on the motor bracket and move the motor back to a point where the belt just stops slipping. Tighten the screws in the motor bracket at this point.
12. A neon indicator operated half wave from the same frequency source as the capstan motor or a stroboscopic lamp triggered from the power line frequency should now be used to check the capstan speed by lighting the strobo disc. A simple, but effective circuit is shown in figure

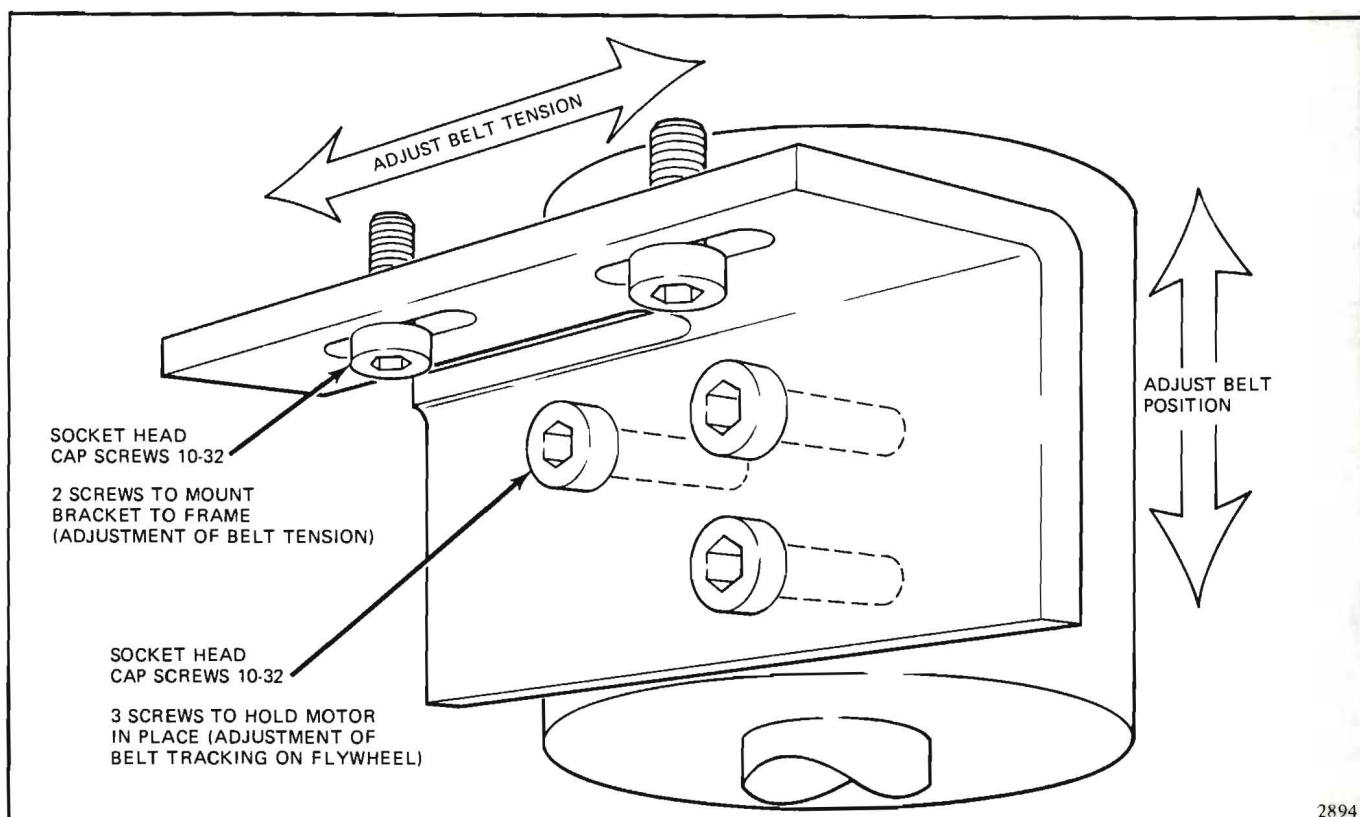


Figure 19. Capstan Motor Mounting Bracket

20. The capstan should appear to run slow; that is, the strobe pattern appears to rotate very slowly in a clockwise direction. Use an improvised wire pointer as a reference and observe how many dark or light elements appear to pass beneath it per minute. Use table 3 to determine speed error with a 48-element strobe wheel on the capstan.
13. Set the Variac voltage to 105 volts and repeat the previous step. If OK, return the Variac voltage to 115 volts.
14. Remove the tape sensor mask.
15. Push in the plunger of the incoming capstan pressure roller solenoid by hand (left side of capstan) and back off the pressure roller linkage adjusting screw until the pressure roller does not contact the capstan.
16. Repeat for the outgoing capstan pressure roller.
17. Insert the tape sensor mask and press the PLAY button. The PLAY button should light, and the STOP button should go out. The incoming capstan pressure roller should swing in toward the capstan. Approximately 1/2 second later, the outgoing capstan pressure roller should

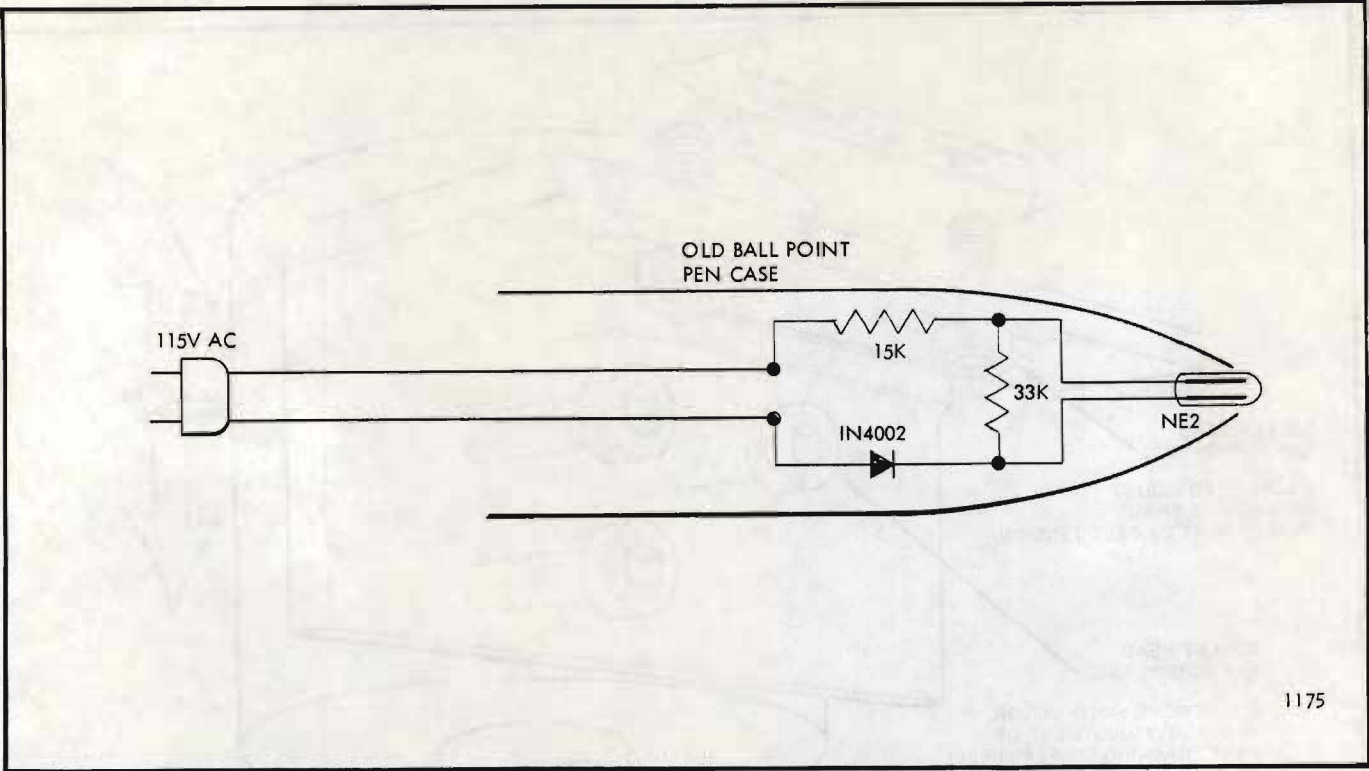


Figure 20. Example of Simple Stroboscope Lamp

Table 3. Capstan Speed Error (for 48 element strobe wheel)

DRIFT ELEMENTS PER MINUTE	SPEED ERROR-PERCENT	
	AT 7-1/2 IPS	AT 15 IPS
2	0.056	0.028
4	0.112	0.056
6	0.168	0.084
8	0.224	0.112
10	0.300	0.150

swing in toward the capstan. In the initial interval, the supply reel motor should accelerate in the rewind direction and the take-up reel motor should quickly race to a high speed. After the 1/2 second initial interval, the torque on these motors should be noticeably reduced when the outgoing capstan pressure roller swings in. Because both adjusting screws were backed off, neither capstan pressure roller should rotate from contact with the capstan. The above time delay should be about 1 second on 1/2-inch machines.

18. Adjust the incoming linkage screw until the incoming pressure is just positively driven by the capstan. Give the screw one more full turn in the same direction. Be certain that the solenoid plunger seats completely on repeated operations.
19. Repeat the previous set for the outgoing pressure roller except give the screw a final $3/4$ turn.
20. Remove the tape sensor mask, stopping all motors and releasing the pressure rollers.
21. Reel torque measurements are performed next. For this purpose, it will be necessary to employ a 10 ounce or 1 pound spring scale, preferably with a hooked end, and an empty 10-1/2 inch reel. Drill two holes in one of the reel spokes large enough to accept the scale hook. One of these should be at 2 inches from the center of the reel, and the other at 5 inches from the center of the reel. Use the outer one for heavy torque measurements, the inner one for the low torque measurements. Place the special reel on the supply reel side and hook the spring scale into the 5-inch radius. Holding the spring scale firmly in place, reinsert the tape sensor mask and press the REWIND button. The STOP button light should go out and the REWIND button should light. Observe the ounce inches of stall torque. See table 4. Remove the tape sensor mask.

NOTE

Table 5 converts the spring scale reading to motor torque. For values now shown on the table simply multiply the spring scale reading in ounces by the radius in inches to find the motor torque in ounce inches.

22. Remove the special torque measurement reel from the supply reel and place it on the take-up side. Place the spring scale at the 5-inch radius. Replace tape sensor mask and, holding the spring scale firmly in place, press the FORWARD button. The STOP button light should go out and the FORWARD button should light. The torque should be the same as for the rewind motor.

NOTE

Torque of either motor will vary somewhat with angular position due to commutation, but exact value is not critical. Plus or minus 20% is acceptable.

Table 4. Spring Scale Reading to Motor Torque Conversion Table

AT 5-INCH RADIUS		AT 2-INCH RADIUS	
SCALE READING	MOTOR TORQUE	SCALE READING	MOTOR TORQUE
4.0 oz.	20 oz. in.	3.00 oz.	6.0 oz. in.
4.2	21	3.25	6.5
4.4	22	3.50	7.0
4.5	23	3.75	7.5
4.8	24	4.00	8.0
5.0	25	4.25	8.5
5.2	26	4.50	9.0
5.4	27	4.75	9.5
5.6	28	5.00	10.0
5.8	29		
6.0	30		
6.2	31		
6.4	32		
6.6	33		
6.8	34		
7.0 oz.	35 oz. in.		

23. Remove the tape sensor mask, stopping the motors. Reinsert the tape sensor mask. Press the PLAY button. The starting torque of the take-up motor should be approximately as listed in table 5 for initial period until outgoing capstan pressure roller operates. The torque should then reduce to running torque values listed in table 5.

Table 5. Take-up Motor Torques

TAPE WIDTH	STARTING TORQUE	RUNNING TORQUE
1/4 in.	12 oz. in.	8 oz. in.
1/2 in.	24 oz. in.	8 oz. in.

24. Remove the tape sensor mask. Put the special reel and spring scale on the supply reel spindle, using the 2-inch radius hole. Replace the tape sensor mask. Press the PLAY button. The starting torque should be as listed in table 6, reducing to the running torque listed in table 6 after operation of outgoing capstan pressure roller.

Table 6. Supply Motor Torques

TAPE WIDTH	STARTING TORQUE	RUNNING TORQUE
1/4 in.	7 oz. in.	5 oz. in.
1/2 in.	10 oz. in.	7 oz. in.

25. The required torques will generally be realized if the sliders on R61 and R62 are set to maximum resistance for 1/4-inch tape, midway for 1/2-inch tape.
26. Remove the tape sensor mask. Remove the spring scale and reinsert the tape sensor mask. Check that the LARGE REEL switch is in the center position. Hold the take-up motor by hand so that it cannot turn. Press the FORWARD button. The supply reel motor should rotate slowly in a counterclockwise direction. Slide the LARGE REEL switch to the right. The motor should stop. Slide it to the far left. The motor should run, as in the center position. Remove the tape sensor mask. Place the LARGE REEL switch in the center position.
27. Replace the tape sensor mask and repeat the previous step, holding the supply reel motor and pressing REWIND button. The take-up motor should rotate slowly in a clockwise direction. Slide the LARGE REEL switch to the left. The motor should stop. Slide it to the right. The motor should run, as in the center position. Place the switch in the center position and remove the tape sensor mask.
28. Press the POWER button and shut off the power. Connect a DC voltmeter (50 volt scale) from the collector (stud) of the 2N174 regulator transistor (Q60) to ground. Be careful not to ground the test lead. Press the POWER button. It should show 26 to 28 volts. Insert the tape sensor mask and press the PLAY button. Then press the FORWARD button, and then the REWIND button. The voltage should remain at 26 to 28 volts. Reduce the input line voltage to 105 volts and repeat. Only below 105 volts input should the voltage ever drop below 26 volts. Reset the input to 115 volts.
29. Place a reel of tape on the transport, and thread the tape as described under General Operating Procedures.
30. Press the PLAY button. The head cover door should close smoothly within 3/4 second. The tape should be driven by the capstan and wound up by the take-up reel. In starting, it should accelerate

smoothly without snapping from the supply reel or throwing a loose loop within the closed loop area. When properly adjusted, the incoming capstan pressure roller should move quickly to contact the tape and then slowly seat under the control of the dashpot, thereby gently increasing the tape pressure on the capstan and giving it a gentle acceleration. Generally, the dashpot must be adjusted to maximum damping. Loosen the ROLLER SEATING adjustment screw (figure 17) and move the adjustment linkage in the direction for proper puck operation. The outgoing capstan pressure idler operates only after the tape is up to speed.

31. Press the STOP button. The head cover door should open instantly and the tape should stop. A reverse motion for an inch or two is permissible.
32. Press the FORWARD button. The head cover door should be open and the tape lifters should operate. Wind the tape to within 100 feet of its end. Press the STOP button. The FORWARD lamp should go out and the REWIND lamp should light, indicating reversed torque, thus bringing the tape to a standstill, at which time the REWIND lamp goes out and the STOP button lights. The tape lifters should drop back to normal.
33. Press the PLAY button. The tape should start as smoothly as it did at the beginning of the reel. If the tape does not start smoothly because the incoming roller is engaging too slowly, the adjustments in step 30 should be repeated until smooth operation is obtained. An optimum point of sufficient puck pressure and damping of puck engagement must be reached for best tape handling. After adjustment, rewind the tape and repeat all steps from 30 on.
34. Press the REWIND button. Somewhere in the middle of the reel, press the STOP button. The REWIND lamp should go out and the FORWARD button should light, indicating reversed torque is applied. When standstill is reached, the FORWARD lamp should go out, and the STOP button should light, and the tape should come to a stop. A few inches overshoot in the reverse direction is permissible.
35. Press the REWIND button. When tape is up to relatively high speed, press the PLAY button. Reverse torque is applied and, when the tape stops the machine should immediately go into the run mode, the tape lifters drop back, and the head cover door closes smoothly.
36. Repeat the previous step except from the forward mode.
37. When in run mode, press the REWIND button. The pressure rollers should drop out, the head cover door should open quickly, the tape lifters should operate, and the tape should go into rewind.

38. Stop the tape and then press the PLAY button.
39. While the transport is in RUN, press the RECORD button. Nothing should happen.
40. While holding the RECORD button depressed, press the PLAY button again. The RECORD button should light.
41. Press the STOP button. The PLAY button and the RECORD button lights should go out.
42. Observe all white relay covers and put the transport through all normal functions looking for sparking contacts. Arcs may be seen through the translucent covers. Particularly look for sparking of contacts 1 and 9 of K1 which controls capstan motor power. Very light arcs are permissible but a bright arc indicates faulty suppressors C4 and R23. These must be functioning or the relay will fail.
43. Check the time required for the head cover door to open and to close as demanded by various functions described above. It should take from 1/2 to 3/4 seconds to close but should open immediately. Adjust the connected dashpot for proper closing time.
44. The tape lifters must swing out fully whenever the tape is in REWIND or FORWARD mode, or in the process of stopping. When released, they must fall back fully so as not to interfere with normal tape motion over the heads. Test their action at the start of a reel, in the center of a reel, and at the end of a reel to be sure they always operate fully and release fully. Check that they do not chatter when the tape reverses direction between FORWARD and REWIND modes. The tape lifters are adjusted by loosening the screw in the end of the shaft, and changing the position of the tape lifter solenoid plunger with respect to the lifter. This can be accomplished from the underside of the transport as shown in figure 18.
45. Be certain that the tape clears the reel flanges with plenty of space to assure freedom from scraping.
46. Record head and reproduce head azimuth is set during signal electronics alignment.

Flutter

Flutter is checked by recording a 3 kHz signal and then playing it back into a flutter meter.

Flutter checks are useful as a troubleshooting aid in determining which component, or group of components, is contributing to the flutter. Using a D & R Ltd, Varo, or equivalent flutter meter, in which three bandpasses are provided. Components contributing to flutter can be determined, as shown in table 7. The following steps are to be followed in checking the flutter.

NOTE

It is extremely important that all tape guides, heads, capstan surface, puck idlers, capstan flywheel, and capstan motor spud be thoroughly cleaned with alcohol before making flutter checks.

Table 7. Components Contributing to Flutter

WAVEBAND	COMPONENT AREA
0.5 to 30 Hz	Flywheel and capstan
30 to 300 Hz	Capstan motor and reversing idler
0.5 to 300 Hz	Used to check overall flutter up to 300 Hz

- 47. Connect an audio oscillator to the input of the recording electronics Set the oscillator frequency to approximately 3 kHz (some flutter meters contain their own internal oscillator). Connect the output of the playback electronics to the flutter meter input.
- 48. Set the capstan motor to high speed (normally 15 ips). Position the tape so that it will start near the beginning of the reel.
- 49. Record the test signal at 0 VU for approximately 3 minutes. Rewind the tape to the start of the test signal recording.
- 50. Start the tape and calibrate the input level to the flutter meter. Check the frequency acceptability to the discriminator, then switch to the full band flutter position (0.5 to 300 Hz). Employ 0.5% full scale sensitivity. Flutter should not exceed 0.05% at 15 ips, nor 0.07% at 7-1/2 ips.
- 51. Since it is possible for flutter components to cancel in playback because the phase of the recorded flutter may be opposite to the same component being generated during playback, it is necessary to stop and start the tape during playback at least 15 or 20 times

and to accept the worst reading, where the recorded and reproduced phases are additive, as the true worst flutter case. This must be done on each test. Do not check flutter with a playback head while recording the carrier with another head.

52. Make each flutter measurement at about 100 feet from the beginning of the reel, near the center, and again at about 100 feet from the end of the reel.
53. Identify any prominent frequency components in observed flutter, using an oscilloscope. Sources of such components must be determined and steps taken to minimize them if they cause overall flutter readings to exceed specifications. Several sources are:
 - a. Rotation rate of the capstan. A large component at this rate indicates a faulty flywheel tire.
 - b. Rotation rate of the reversing idler (same rate as capstan).
 - c. Rotation rate of the ingoing pressure roller.
 - d. Rotation rate of the outgoing pressure roller (rate close to that of c).
 - e. Rotation rate of the capstan motor.
 - f. Rotation rate of the takeup or supply reel.
 - g. Resonant component of the reversing idler mass coupled to elasticity of the tape; approximately 100 cycles on the idler for 1/2 inch tape. Try running the tape at high speed over the reversing idler. If the latter produces considerable noise, whining, growling, or hissing, it may mean that the bearings have been damaged; in which case the idler should be replaced, since considerable flutter will otherwise be generated. Do not try to repair the idler. Replace it.
 - h. Magnetic imbalance in capstan motor causing a 60-, 120-, or 180- cycle component (60-cycle motor) or 50-, 100-, or 150-cycle component (50-cycle motor). This is generally prominent at one speed and barely detectable at the other. Make tests at the speed producing the strongest component, if any, and adjust the value of R63 and C64 (see figure 18) to minimize this flutter component. Motors have been trimmed after installation at the factory to minimize this component by the addition of small value 600-volt tubular capacitors. Further adjustments should seldom be required but are made by adding or removing such trimmers.

54. Disconnect the power cord. The hinged plug cover must swing into position, making it impossible to again plug in the power cord without first lifting the hinged cover. Observe that when the cover is in place over the plug, the capstan motor is locked mechanically away from the capstan flywheel so that it cannot swing back and forth in shipment.
55. Be certain the capstan motor counterbalance spring is in the proper position for vertical or horizontal service, as required (see figure 10).
56. Replace the cover plate and return the transport to service.

SIGNAL ELECTRONICS ALIGNMENT

The 3M Brand Professional Audio Tape Recorder is factory aligned for peak performance. All alignment controls are behind the panel on the front of the electronics assembly and are screwdriver adjusted. See figure 21. For access, simply drop the hinged panel downward. The circuit boards and controls are illustrated by a label on the back of this panel.

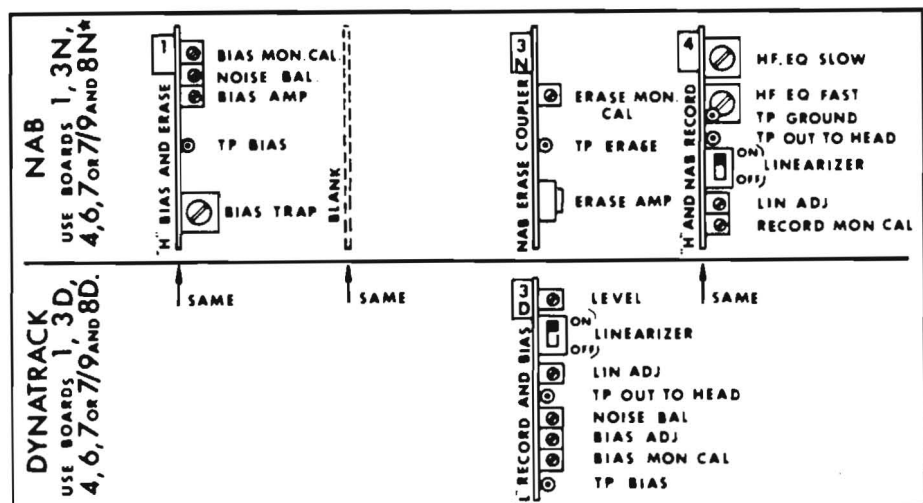
Playback Alignment

The playback circuits are normally factory aligned to match Ampex standard alignment tapes as follows:

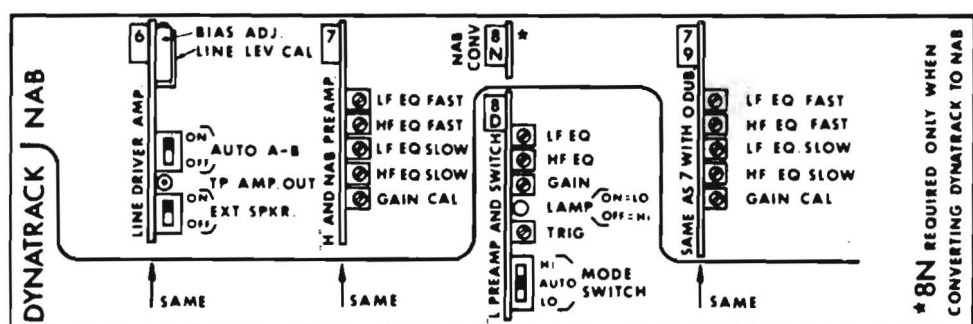
Speed (ips)	Tape Width (inches)	Stock No.
15	1/4	01-31311-01
15	1/2	01-31311-05
15	1/4 (full track)	01-31311-01
7 1/2	1/4	01-31321-01
7 1/2	1/2	01-31321-05
7 1/2	1/4 (full track)	01-31321-01

The procedure is as follows:

1. Thoroughly degauss and clean all heads.
2. Place the 15-ips standard alignment tape on the tape transport. Be sure that card 7/9 is inserted into slot No. 7.
3. Set the REC. SELECT switch to SAFE and the METER switch to CAL.



LEFT BAY



RIGHT BAY

Figure 21. Electronics Assembly Adjustment Locations

NOTE

Be certain that the output impedance and termination switches on the rear of electronics assembly are in the proper position for the connected outgoing line.

4. Remove the head cover plate to expose the head azimuth adjusting screws.
5. Set the transport to operate at 15 ips and press the PLAY button. When the reference tone of 700 Hz appears, the meter should indicate zero VU. If it does within 1/4 VU, proceed to step 6. If not, adjust the GAIN CAL. control on the board in slot 7 until it does.
6. Play the 10 kHz test tone. The output shall be within $\pm 1/2$ VU of the 700 Hz reference tone. If not, perform step 9.
7. Rewind the test tape to the 15 kHz tone, and adjust the playback head azimuth (figure 22) for peak output.
8. Connect the outputs from the reproduce electronics corresponding to the top and bottom playback heads to the inputs (Vertical and Horizontal, respectively) of an oscilloscope to produce a lissajous pattern (any other appropriate method to check phasing may be used). Start the alignment tape at 2 kHz and adjust the playback head azimuth for zero phase error. Check each frequency up to and including 15 kHz for phase error. Check each combination of any two tracks and optimize the azimuth for a phase error of less than 90 degrees.
9. Play the 10 kHz test tone and adjust the HF EQ FAST control on card 7, if necessary, to obtain the output level required in step 6.
10. Run through the rest of the test tape. Overall response should be within ± 1 VU from 12,000 to 50 Hz. 15,000 may be between +2.5 VU and zero VU. 30 Hz may be ± 2 VU from the original 700 Hz reference. Low frequencies may be adjusted with the LF EQ FAST control on the preamplifier board in slot No. 7.
11. After making the necessary equalizer adjustments, rewind and replay the standard tape to be certain that all frequencies are within limits.
12. Remove the standard tape, preferable "tails" out.

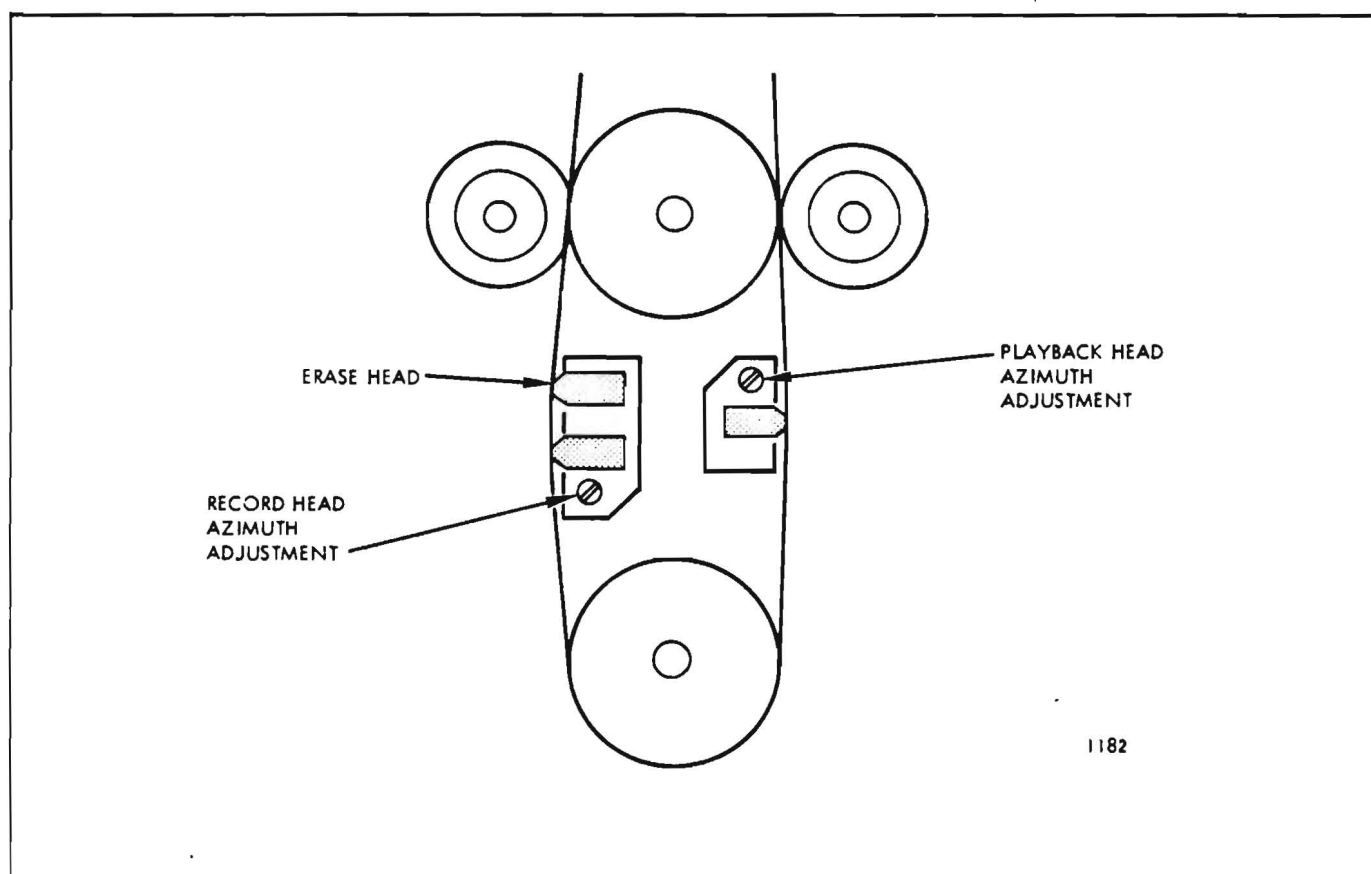


Figure 22. Record and Playback Head Azimuth Adjustments

The 7-1/2-ips playback alignment is done in exactly the same manner except that the initial 700 Hz tone and the frequency run are at 10 VU below zero VU. They are followed by 700 Hz at zero VU and this should first be observed, as outlined under preceding step 6. Then rewind the tape to the first 700 Hz band, set the METER switch to SIGNAL, press the B OUTPUT transfer button and adjust the REPRO. LEVEL control to indicate -5 VU. The REPRO. LEVEL control is now set 5 VU higher than normal CAL. level, but it permits more accurate readings. Then check for ± 1 VU response 12,000 to 50 cycles and ± 2 VU 15,000 to 30 Hz, as outlined in steps 9 and 10. Adjusting HF EQ SLOW and LF EQ SLOW rather than HF EQ FAST and LF EQ FAST. These are automatically switched in when the tape speed is changed. The head azimuth adjustment and GAIN CAL adjustment made at 15 ips should not be disturbed unless 7-1/2 ips is to be considered the speed of primary usage.

Record Alignment

The alignment procedure to follow should be carried out, using a length of tape from the supply to be used for subsequent recording, whenever possible. The 3M Brand Professional Audio Recorder is factory aligned to use 3M types 201, 202 and 203 tape. It is essential that the preceding playback alignment be checked before record alignment.

15 IPS Tape Speed Alignment

1. Set REC. SELECT switch to RDY., the METER switch to SIGNAL and press the A transfer button. The RECORD LEVEL control need not be adjusted from its normal operating position if it has been locked in place. The LINEARIZER switch on the Hand NAB Record Board in slot 4 should be in the OFF position. Connect an audio signal generator to the recorder input (J101).
2. Set the audio signal generator to 1000 Hz and raise the level until the VU meter indicates 0 VU.
3. Check to be sure that meter continues to indicate 0 VU as the oscillator frequency is changed between 30 Hz and 15,000 Hz. If there is more than $\pm 1/2$ VU deviation in these indications, the reasons must be discovered before continuing with the checkout. Possible reasons may be unstable oscillator output versus frequency, improper termination, shunting capacitance on the input line, or capacitive feed (one lead open between the oscillator or recorder).
4. Listen with a monitor speaker or earphones to be sure no strong noise or hum component is picked up at the input terminals in addition to the oscillator tone.
5. Start the recorder in RECORD mode. Turn the METER switch to CAL.
6. Adjust the BIAS AMP control on the Bias and Erase Amplifier Board in slot 1 to give a maximum indication on the VU meter for the 1000 Hz signal. The maximum should occur at zero VU. If the meter indicates other than 0, adjust the input signal level for a 0 indication. Turn the METER switch to SIGNAL, press the A OUTPUT button and adjust the RECORD MON. CAL. control on the NAB Record Board in slot 4 until it again indicates 0. Return the METER switch to the CAL position.
7. Set the oscillator to 7000 Hz. Adjust the azimuth of the record head stack to give a maximum indication on the VU meter. Reset the oscillator to 15,000 Hz and again carefully adjust the record head azimuth for maximum. Using a similar method as in step 8 of the NAB Playback Alignment, adjust the record head azimuth screw (figure 22) for less than 90 degrees phase error between any two tracks.

8. Make a frequency run from 15,000 to 30 Hz and observe the VU meter. If it lies within ± 1 VU from 40 to 15,000 Hz, and ± 2 VU at 30 Hz, the performance may be considered satisfactory.
9. If the frequency response is not within acceptable limits, adjust the HF EQ FAST control on the NAB Record Board in slot 4 to bring response within limits.

7-1/2 IPS Tape Speed Alignment

Having checked the playback circuit and adjusted it for flat response as outlined under NAB Playback Alignment, 7-1/2 inch speed, leave the REPRO LEVEL control set in the position established under that procedure which resulted in the standard tape signals recorded at -10 VU showing -5 VU on the meter. Then proceed as follows:

1. Perform steps 1, 2, and 3 of the procedure outlined under NAB Record Alignment, 15 ips Tape Speed Alignment.
2. Reduce the input signal level so that the meter indicates approximately -10 VU.
3. Listen with speaker or phones to be sure there is no strong noise or hum component picked up at input terminals in addition to the oscillator tone.
4. Put the recorder into record mode. Press the B OUTPUT transfer button. The meter should indicate approximately -5 VU.
5. Adjust the BIAS control on the Bias and Erase Board in slot 1 for maximum VU indication at 500 Hz. Readjust input signal level if necessary to get -5 VU.
6. Set the oscillator to 5000 Hz. Adjust the azimuth of the record head stack to give a maximum indication on the VU meter. Reset the oscillator to 15,000 Hz and carefully adjust azimuth for maximum indication. If primary speed of interest is 15 ips, skip this step.
7. Make a frequency run over the range of 30 to 15,000 cycles and observe the VU meter. If it indicates within ± 1 VU from 40 to 12,000 Hz, and ± 2 VU from 30 to 15,000 Hz, the performance may be considered satisfactory.
8. If the frequency response is not within acceptable limits, adjust the HF EQ SLOW control on the NAB Record Board in slot 4 to bring response within limits.

9. Return the signal generator to 500 Hz. Adjust the REPRO. LEVEL control to obtain approximately -10 VU indication. Turn the METER switch to CAL. Raise the input level to obtain 0 VU indication on meter.
10. Press the A OUTPUT transfer button and turn the METER switch to SIGNAL. The meter should indicate 0 VU. If it does not, adjust the RECORD MON. CAL. control on the NAB Record Board, slot 4, until a zero indication is obtained. If there is a discrepancy in this adjustment between the 7-1/2 and 15 IPS setting, adjust it for the speed most important to the application.

NOTE

The above procedure permits frequency response measurements to be made at a signal level 10 VU below the zero reference level. This is essential with low speed tapes (7-1/2 ips or slower) because of the heavy recording preemphasis used for higher frequencies.

Dynamic Range Adjustment (NAB)

1. Connect the signal generator to a calibrated attenuator box and terminate the output of the box. Feed this output to the input of the channel under test. Connect a distortion analyzer and a vtvm to the output terminals. Use a reel of tape of the type for which the recorder has been aligned. The tape speed should be 15 ips.
2. Before beginning noise measurements, it is absolutely essential to degauss and clean all heads very carefully. Turn off the main recorder power switch during degaussing. Connect a high gain power amplifier and loudspeaker to the output terminals of the recorder. Short circuit the input terminals. The METER switch should be set to ERASE with the B OUTPUT lamp lit.
3. Advance the monitor gain so that the tape noise is heard loudly.
4. Remove the 3N board, press the RECORD button, and minimize the noise with the noise balance control on board 1. Press the STOP button.
5. Reinstall board 3N on an extender, press the RECORD button and adjust C1 for peak current (measure at TP1 of board 3N with a vacuum tube voltmeter).

Put board 1 on extender
✓

6. Adjust R3 on board 1 for a reading of between .48 and .55 volt rms, as read at TP1 of board 3N.
7. Readjust C1 for minimum noise nearest the peak. Assure that there is still a minimum of .48 volt rms.
8. Recheck the noise balance on board 1 for minimum noise.
9. Check to see that all tracks will take 1 kHz at 3% down at least 75 dB. If not, R3 on the board 1 should be adjusted to increase the erase current slightly.
10. Press the STOP button. Remove the extender board and plug board 3N into its normal position. Check again to be certain that noise has not increased.
11. Reduce the monitor gain to the normal setting. Set the oscillator to 1000 Hz and use a decade attenuator to insert a 19 dB loss.
REMOVE INPUT SHORTS
12. Set the LINEARIZER switch on the NAB Record Board in slot 4 to OFF.
13. Put the recorder into the RECORD mode. The B OUTPUT lamp must be lit. Readjust the input level to obtain 0 VU on the meter.
14. Measure distortion on the wave analyzer. It should be just under 1% total harmonic distortion.
15. Rewind some of the tape and play it back. Observe the distortion. If it is lower, it means that high-frequency bias current is leaking into the distortion analyzer during recording and all measurements will have to be made through a low-pass filter or during playback only.
16. Return to recording the 1000 Hz signal at 0 VU. Remove 6 db from the calibrated attenuator. The distortion meter should indicate just under 3% total harmonic distortion. Observe the vtvm indication.
17. Disconnect the oscillator from the input to the attenuator and record some tape with this input signal removed, (approximately 30 seconds of tape).
18. Play back the tape so recorded, and read the vtvm. The difference in readings between tape recorded in steps 13 and 16 represents the signal-to-noise ratio measured from the 3% distortion point without the linearization circuit in operation. Place the LINEARIZER switch to ON.

NOTE

Noise figures stated in the system specifications are obtained by the use of bandpass filters. Such filters exclude all noise outside the stated pass-band.

Miscellaneous Adjustments and Circuit Arrangements

When the METER switch is set to the BIAS position during recording, the VU meter indicates a steady level, determined by the amplitude of bias current in the record head. When this current is optimized, the meter indication can be adjusted to a convenient reference by means of the BIAS MON. CAL. control on the Bias and Erase Board in slot 1. This provides a ready check of bias at any time.

When the METER switch is set to the ERASE position during recording, a similar check is provided for the magnitude of the erase current. This may be calibrated to read any convenient level by means of the ERASE MON. CAL. control on the NAB Erase Coupler Board in slot 3.

The recorder is normally set up to supply a 600-ohm line at the +4 dbm level. The output impedance switch can be set to select either 600 ohms or 150 ohms, and the termination switch can be set to 600, 150, or open position. If it is desired to change the working line level from +4 dbm to some other level, it is necessary to change certain resistors on the Line Amplifier Board in slot 6. A chart of values is shown in the circuit description for this board.

The use of the PILOT connector is fully described under circuit descriptions.

The linearizer adjustment should be undertaken in accordance with the following outline. If the user feels the adjustment has been mis-set it may be disconnected by setting the LINEARIZER switch to OFF until properly aligned.

As delivered, the machine is adjusted for use with Scotch brand low-noise tape types 201, 202, and 203. Under normal conditions no adjustments should be necessary. The switch should always be in the ON position except when distortion measurements are being made. If the machine is to use a different type of tape, the LIN ADJ. control may require trimming. This is best done with aid of a wave analyzer. Adjustment is done as follows:

1. Set the METER switch to CAL position.
2. Make the frequency response and dynamic range adjustments and measurements outlined above for the type of tape used.
3. Set LINEARIZER switch to OFF position.

4. Raise record level to give 3% third harmonic distortion.
5. Set LINEARIZER switch to the ON position.
6. Adjust LIN ADJ. control for minimum distortion.
7. Adjust input level to again achieve 3% third-harmonic distortion.
8. Repeat steps 5, 6, and 7 until no change in record level is necessary.
9. Adjust record level to provide zero VU playback level.
10. Press the A OUTPUT button and set METER switch to SIGNAL. Meter indication should remain at 0 VU. If it is higher or lower, adjust RECORD MON. CAL. control to obtain zero indication.

If it should be necessary to adjust the linearizer without the aid of a wave analyzer, a satisfactory approximation to the ideal adjustment can be made with a vtvm as follows:

1. Set METER switch to the CAL. position and LINEARIZER switch to OFF.
2. Using a standard alignment tape establish a reference level on the vtvm.
3. Using the desired tape type adjust the record level to obtain a signal 6 VU above 0 VU.
4. Set LINEARIZER switch to ON. Output level should rise 0.8 VU if the linearizer is properly adjusted. If not, adjust the LIN ADJ. control to achieve the difference.
5. Set the LINEARIZER switch to OFF. If output level is changed from +6 VU, readjust record level to again obtain +6 VU.
6. Repeat steps 4 and 5 until the 0.8 db difference is attained upon operation of LINEARIZER switch and the indicated operating level is +6 VU with the switch in the OFF position.
7. Reset RECORD MON. CAL. control if necessary as outlined above.

To provide overdub recording capability, set up in accordance with the following procedure:

NOTE

For maximum flexibility, it is desirable to employ a No. 7/9 board for normal reproduction, and a permanently installed No. 7/9 board in slot 9 to provide overdub facilities. When furnished in this manner, the recorder is considered having permanent overdub capability.

1. Place a No. 7/9 board in slot 9. Position the REC. SELECT switch to the O. DUB position.
2. Set the METER switch to CAL. Press the PLAY button. Adjust the GAIN CAL control on the 7/9 card for zero VU on the meter when the 700 Hz signal is playing from the standard alignment tape. Press the STOP button.

HEADS

This recorder can be obtained with a 1/4" or 1/2" head configuration. Heads are mounted on a plate which provides azimuth adjustment of both record and playback head stacks. Erase heads are fixed in position. The plate carries a connector which mates with another permanently mounted in the transport. The transport connector has leads attached to it which connect to the electronic assemblies. All of these connectors are physically interchangeable. It is imperative that the number and letter coding be observed.

To change a head assembly, first remove the head cover trim, then the transport cover plate, and then the reversing idler (held in place by one screw under the main casting). See figure 17. Next remove the two metal trim plates (one on either side of the capstan and idler). Remove the screws that hold the head mounting plate in place. Insert two screws into the tapped holes at either end of the connector plug. As these are screwed down, they will jack up the plate and gently separate the connectors. An alternate head assembly may be installed by following the reverse procedure.

TAPE GUIDES

The function of the tape guides is to cause the tape to be fed into the Isoloop without lateral shifting, so that the recorded pattern remains within the NAB margins, and to cause the tape to wind evenly onto the reels so that each turn lies on top of the other and does not contact either reel flange.

The primary tape path reference is the lower flange of the ingoing guide which guides the tape into the Isoloop.

This guide surface is set at a fixed distance from the capstan assembly machined surface, on which the heads are mounted. The desired guiding is one

that feeds tape into the Isoloop with the edges touching, but not binding on the flanges of the incoming guides. The outgoing tape guides are wider. Their flanges do not guide the tape in the normal running mode.

Tape guides will not normally require adjustment. The replacement guides are installed by their center screws. Proper flange height is established by holding machining and plating tolerances, and no shimming or threaded adjustment is required.

To assure that tape guiding is satisfactory, and that no damage or misadjustment has occurred, the following examination can be made.

1. The lower edge of the tape (inner edge of the tape if the transport is mounted vertically) registers lightly on the lower (inner) flange of the incoming guide nearest the capstan. The tape does not move up or down on the reversing idler as the tape direction shifts from forward or rewind.
2. The wear pattern on the heads and guides is straight-sided. (Not keystoned, which would indicate uneven tension across the tape.)

REEL HUBS

The function of the reel tables and holddown hubs is to hold the tape reels in plane of the tape path, so that tape is fed out and spooled without scraping on either reel flange. The hub is held in place by a shaft collar on the reel motor shaft. See figure 23. Position of the collar is secured by two setscrews. After a reel is installed, the finned, spring-loaded top of the knob may be turned a few degrees clockwise, which will lift the there small bevelled projections up out of the reel keyway slots to rest on the top of the reel, locking it firmly to the reel table. Reel table height should not require readjustment unless a reel motor is replaced.

A small 1/4-inch center reel table and hub is available to accommodate home-recorder type reels. To install this reel table, the large coinslot center screw in the NAB reel hub is loosened, the top lifted off, and three small Phillips screws removed. The 1/4-inch table and hub are then installed, using the three flat-head screws. The 1/4-inch reels are held in place by turning the top part of the spindle so that the bevelled keys rest on top of the reel, as in the NAB hub.

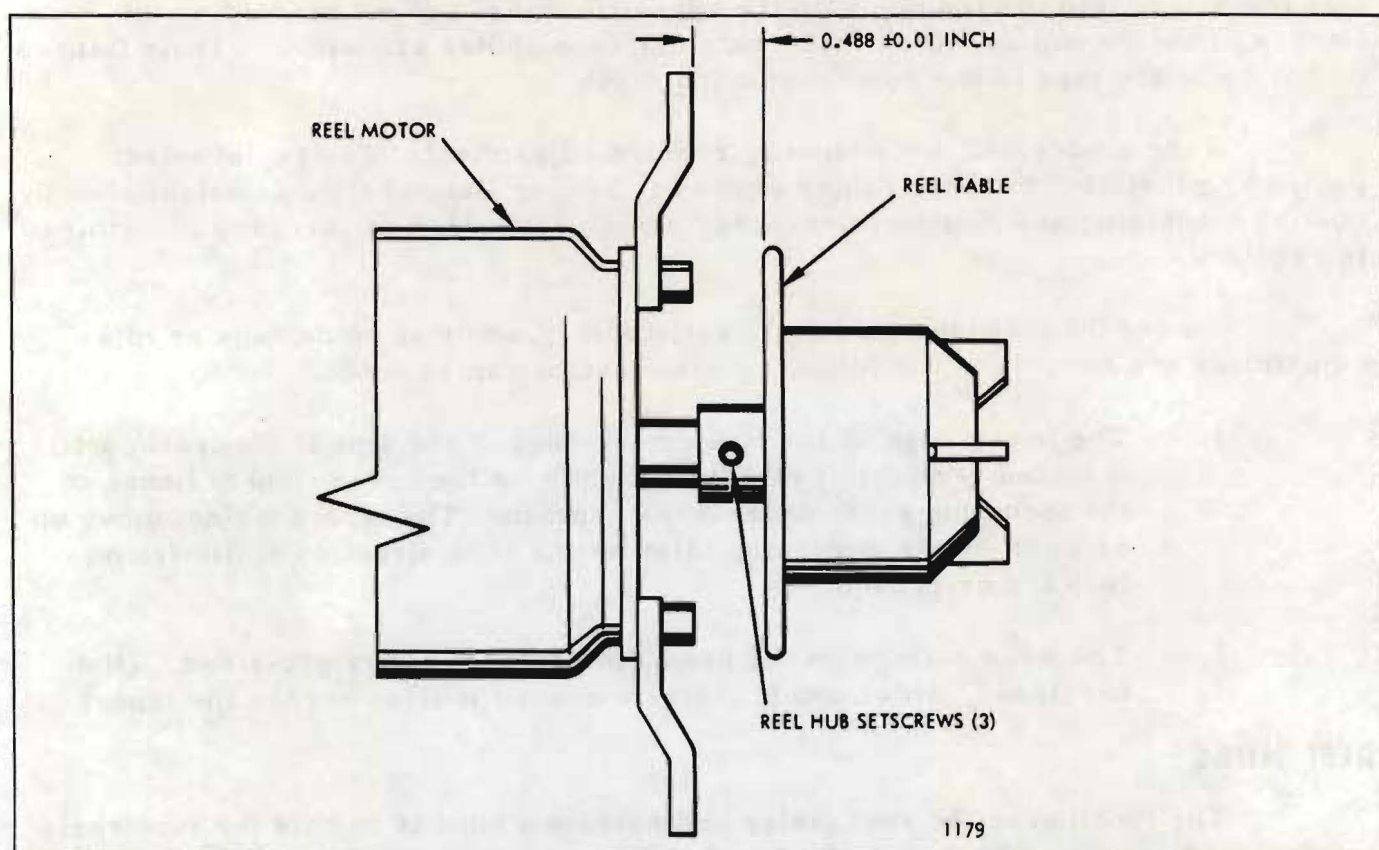


Figure 23. Reel Hub Adjustment

MAINTENANCE

Maintenance of the 3M Brand Professional Audio Recorder will normally consist of adjustment and repair as needed. Adjustments are presented in the Alignment and Adjustment section. This section contains special notes concerning maintenance and troubleshooting.

GENERAL PRECAUTIONS

The following paragraphs contain some general precautions which should be observed when performing maintenance on the recorder.

1. Do not strike the reversing idler. It is delicate and located in a vulnerable position at the front of the mechanism. If damaged, flutter will be excessively high.
2. Exercise great care in installing head mounting plates. They can be screwed into place with a head lead pinched between the mounting plate and the transport casting, thus breaking wire insulation or cutting a head lead. Be certain no leads will get in the way before installation.
3. Exercise great care in removing and replacing the mu metal cover over the playback head stack. The slot at the rear of the cover can slice head lead insulation, thereby grounding head leads or actually cutting through them. Be certain that this cover is fully seated so that the lower lip will not scrape on tape as it passes by. Otherwise tape edge may be cut and bad tracking over the heads may result.
4. Do not go from REC. to SAFE when the recorder is operating in the RECORD mode. First stop the transport. This will prevent a thump from being recorded in the tape and magnetization of the record head.
5. Do not remove any of the electronics cards when the power is on. It requires only a few seconds to turn off the power, remove a card, restore power and be ready to operate. Otherwise it is possible to magnetize a head or damage a meter.
6. It is particularly important when moving a 7/9 board from position 9 to position 7 to first turn off the power, then wait about 20 seconds before removing the board and reinstalling it.
7. Be certain to remove the power cord from the transport when moving the recorder. This is to ensure that the capstan motor lockout device will prevent the motor spud from pounding the flywheel.

9. Never carry an electronics assembly face downward as the power supply module may fall out.
10. Do not allow reels or flanges to scrape on the painted surface of the trim plate as this will mark it badly. Scraping can be caused only by bent reels or flanges which, if they cannot be repaired should be discarded.

TROUBLESHOOTING

Failure of the recorder to operate properly may be caused by a malfunction in the recorder, or by external causes. Before troubleshooting the recorder, verify that the power and signal connections are correct, and that all of the operational controls are properly set.

Some of the troubles most likely to be encountered are presented in table 8. However, the best troubleshooting tool is a familiarity with the equipment and a thorough understanding of its theory of operation.

Table 8. Troubleshooting

SYMPTOM	CAUSE	CORRECTION
TRANSPORT		
1. Transport stops when leader tape passes photo cell V60, particularly after machine warms up.	Photo resistor V60 is too sensitive.	Temporary: mask cell or lamp with one or more thicknesses of white splicing tape. Permanent: change value of R71 to a lower value best determined by test. Be careful to avoid grounding any wiring on the circuit board or cell leads.

Table 8. Troubleshooting (Cont'd)

SYMPTOM	CAUSE	CORRECTION
2. Transport will not stop when tape runs out. STOP button lights when tape is not threaded.	Lamp DS8 low in light output.	Replace the lamp. Lamps blacken after long use. If type 313 is found in socket, replace with 1820, longer life bulb.
	Weak photo resistor V60.	Replace V60 or try raising value of R71. Try 40K. Be careful to avoid grounding any wiring on circuit board or photo cell leads.
3. Capstan motor will not start when tape is threaded and the STOP light does not go out.	V60 damaged by accidental grounding.	Replace V60.
4. Capstan motor will not start when tape is threaded, but STOP light goes out.	Plug P11 separated from J11.	Connect the two parts, P11 to J11.
	Speed change switch off normal.	Operate switch to desired speed.
5. Transport coasts to stop from play mode when stop button is pressed.	Relay K7 cannot be operated during stop sequence because the reed switch is not closed.	Adjust the flag stops and/or clearance of magnets from the switch to restore operation.
6. Transport coasts to stop from the FORWARD mode when the STOP button is pressed. Possible tape breakage.	Same as 5, above.	Same as 5, above.
7. Transport coasts to stop from the REWIND mode when stop button is pressed. Possible tape breakage.	Same as 5, above except K6.	Same as 5, above.

Table 8. Troubleshooting (Cont'd)

SYMPTOM	CAUSE	CORRECTION
8. Tape continues in REWIND when the stop button is pressed. Restores to normal after tape runs out or POWER switch is turned off and on.	Tape motion direction sensor flag binding against forward direction stop post.	Check height of flag to be sure it clears screw head and locking nut of the post.
9. Tape continues in REWIND when the stop button is pressed. Does not clear after tape runs out or POWER switch is turned off and on.	K7 hung up. Contacts 5 and 9 sticking.	Replace K7 with another relay. Interchange with K2 after burnishing contacts 5 and 9 if no other relay is available.
10. Tape continues in FORWARD when STOP button is pressed. Restores to normal after tape runs out or POWER switch is turned off and on.	Same as 8, above. Damaged CR33 or CR34 giving half wave power. Low Line Voltage.	Same as 8, above. Check diodes and replace defective unit. Arrange for higher input voltage. Use auto transformer or Variac if necessary.
11. Transport throws loop when starting in Play mode, generally worse near end of reel rather than beginning.	Ingoing Solenoid, capstan idler, dash pot needs adjusting.	Adjust so that dashpot piston is completely at end of cylinder when at rest position. Dashpot load should be picked up just as puck builds up sufficient tape pressure on capstan to cause tape to move forward. Then dashpot will allow pressure to increase as tape is accelerated to running speed. Solenoid must seat instantly when power is applied, coupling spring allows gradual buildup of puck pressure adjusted by Phillips screw in solenoid arm linkage. Dashpot adjusted by bending two tangs on fork linkage.

Table 8. Troubleshooting (Cont'd)

SYMPTOM	CAUSE	CORRECTION
12. Sluggish Solenoid operation; L1, L2.	Misalignment or in need of lubrication.	Try lubricating first with graphite or silicone. Loosening to improve alignment may change absolute position of linkages when plunger is seated necessitating their further adjustment.
13. Tape lifter hangs up.	Misalignment or in need of lubrication.	Plunger must not drag too forcefully against core of solenoid. Body should be so positioned to avoid such side drag, and to provide best compromise of depth of travel to satisfy easy override yet adequate lifting power.
14. Tape lifter difficult to override manually.	Plunger approaches full seated position too closely.	
15. Tape lifter fails to lift tape from heads.	Plunger operating too far from seated position.	Loosen two mounting screws, lubricate plunger and shift body (holes are oversize) to achieve above requirements.
16. Flutter and Wow excessive.	Numerous sources possible. Most likely are: a) Head cables dragging on flywheel belt, b) Insufficient capstan idler pressure either ingoing or outgoing, c) Defective reversing idler, d) Dirty spud on motor shaft.	Remedies are obvious; also see transport alignment for more details.

Table 8. Troubleshooting (Cont'd)

SYMPTOM	CAUSE	CORRECTION
17. Transport appears completely dead.	Blown fuse F1.	Replace with 5 amps slow blow.
	Intermittent operation of power switch S6.	Press a few times to observe if lights come on.
	C66 charged to greater than 30 volts but no 27 volt dc at collector of Q60 or at test point means Q60 is defective.	Replace Q60 after checking load resistance from collector to ground for short circuit defect. Clear defect before again applying power.
18. All lamps excessively bright and short lived.	Regulator Q60 and associate circuit, Q1, R14, R15, and CR50 not functioning.	Replace Q60. Catcher diode CR51 will also require replacement if condition persisted for more than a few seconds. Check resistance of 27 volt load to be certain Q60 will not be overloaded. Transport may be operated without CR51 until replaced.
ELECTRONICS		
1. Meter lights but no signal. Record light will not light. Regulator transistor in power supply abnormally warm.	Short circuit on plus 28 volt bus.	Remove one plug-in board at a time and reinsert to determine if fault is in cards or module wiring. C4 on power supply unit possible shorted. System may operate without C4 until replaced.
2. Playback preamp in slot 7 or 9 distorted or no output.	Bias of Q2 improper.	Collector of Q2 should be per schematic. See figure 46. Defective Q1 or Q2 causes drift.

Table 8. Troubleshooting (Cont'd)

SYMPTOM	CAUSE	CORRECTION
3. A-B transfer causes bad clicks in output (moves meter pointer).	Leaky capacitor C15 in output of record monitor amplifier on board in slot 4 or at output of preamp in slot 7 or 9. Also can be leaky input capacitor to line amplifier in slot 6 (C9).	If REPRO. LEVEL pot is noisy when turned, fault is in output of board in slot 7 or input of board 6. Extract board 7. If still noisy card 6 is at fault. If pot is not noisy when turned, trouble is probably at output of board 4 (C15). Replace faulty tantalum capacitor.
4. Loss of signal in record, reproduce or monitor circuits.	Broken leads on black tantalum capacitor, likely on any board.	These capacitors are somewhat vulnerable since they project higher off the board than other components and their leads are not flexible. Replace with identical item.
5. Loss of signal in record board.	Defective Field effect transistor Q2. Easily damaged by static charge from soldering iron or tool held in hand.	Replace Q2. Be very careful to avoid static charges. Ground soldering iron tip by flexible lead to ground bus of record board. Always use insulated screwdriver or plastic blade to adjust eq. cap C18 or C19.
6. Noise or intermittent operation in any area of electronics module.	Dirty contacts at base of card at plug.	Remove and reinsert card. Use ink eraser to clean contact surfaces of cards. Sockets are gold plated. They should be ok.
7. High distortion	Insufficient bias.	Adjust to peak per instructions in this manual.

Table 8. Troubleshooting (Cont'd)

SYMPTOM	CAUSE	CORRECTION
7. (Cont'd)	Magnetized head, either record or reproduce.	Degauss heads.
	Noise balance control misadjusted.	Adjust for minimum noise after degaussing all heads.
	Faulty record or playback amplifier biasing.	Check voltages per schematic. If drastically different at any point, find cause and remedy.
8. Poor noise figure.	Noisy Q1 or Q2 in preamplifier.	Substitute another pre-amplifier to compare noise and replace transistors.
	Head cables badly routed, near hum fields.	Reroute for minimum noise. Keep away from power cord. This can be very important.
	Head cables rubbing on flywheel.	Noise arises from microphonics of cables under vibration. Must be rerouted to clear flywheel.
	Defective playback head requiring excessive gain.	Replace head. Try break-in tape if head appears to be smeared over by magnetic material.
	Lack of good system ground can produce hum or buzzing. Third wire in power cord not always effective as good ground.	Connect frame of recorder to good effective ground.

Table 8. Troubleshooting (Concluded)

SYMPTOM	CAUSE	CORRECTION
9. Wrong output level.	Improper choice of line impedance or termination.	Set switches S105 and S106 to proper arrangement for line being fed by recorder.
	VU calibrated to wrong line level for specific application.	Check value of resistors R1, R2, R3, on board in slot 6. See table 10.
10. Meter lights brighter than normal.	Meter light socket touching ground.	Move socket slightly, and cover with insulating tape.
	Defective lamp.	Replace lamp.
11. Meter lights, A-B lights not lit. R13 on power supply hot.	Ground on brace to terminal 18.	Remove clamping screw and insert mica insulating washer. Replace screw.

FIELD SERVICE

Regular scheduled maintenance service is available from the Mincom Division service office on a contract basis. If immediate service is required, it may be obtained on an emergency basis. Every effort is made to furnish the needed repair as soon as possible. For a complete description of 3M's maintenance service plans and their costs, contact the Mincom Division service office.

FACTORY REPAIR SERVICE

If desired, the recorder or major assemblies, may be returned to the factory (transportation prepaid) for repair. When recorder or assembly is returned:

1. Indicate the symptom of defect. State as completely as possible, both on an instrument tag and on the order form, the nature of the problem encountered. Too much information is far better than too little. If the trouble is intermittent, please be specific in describing the instrument's performance history.
2. Give special instructions. If any changes in the instrument or assembly have been made, and it is desired to retain the modified form, please indicate this specifically.
3. To facilitate expeditious repair, your Contract or Purchase Order authorizing the work should be directed to Mincom Division - 3M Company - 300 South Lewis Road - Camarillo, California 93010 - Attn: Contracts Department.
4. Pack securely and label. Proper packaging saves money. The small amount of extra care and time it takes to cushion a part or instrument properly may prevent costly damage while in transit. Make certain that the address is both legible and complete; failure to do so often results in needless delay. Address all shipments and correspondence to:

Mincom Division
3M Company
300 South Lewis Road
Camarillo, California 93010

Attn: Receiving Inspection

5. Show return address on repair correspondence. Please clearly indicate the exact address the equipment should be returned to after repair is completed. Terms are net 30 days - f. o. b. , Camarillo, California.

PRINCIPLES OF OPERATION

INTRODUCTION

The 3M Brand Professional Audio Tape Recorder is an advanced audio recording instrument that incorporates the best techniques available at the present state of the art. A tape recorder consists basically of a tape transport (deck) and record and reproduce (play) electronics. The signal to be recorded is amplified and applied to a magnetic record head, which impresses a magnetic pattern in the oxide coating of the magnetic recording tape in accordance with the variation of the input signal. During reproduction (play) the variations in magnetic flux that were impressed on the tape during recording, are sensed by a reproduce head, amplified, and applied to the recorder output.

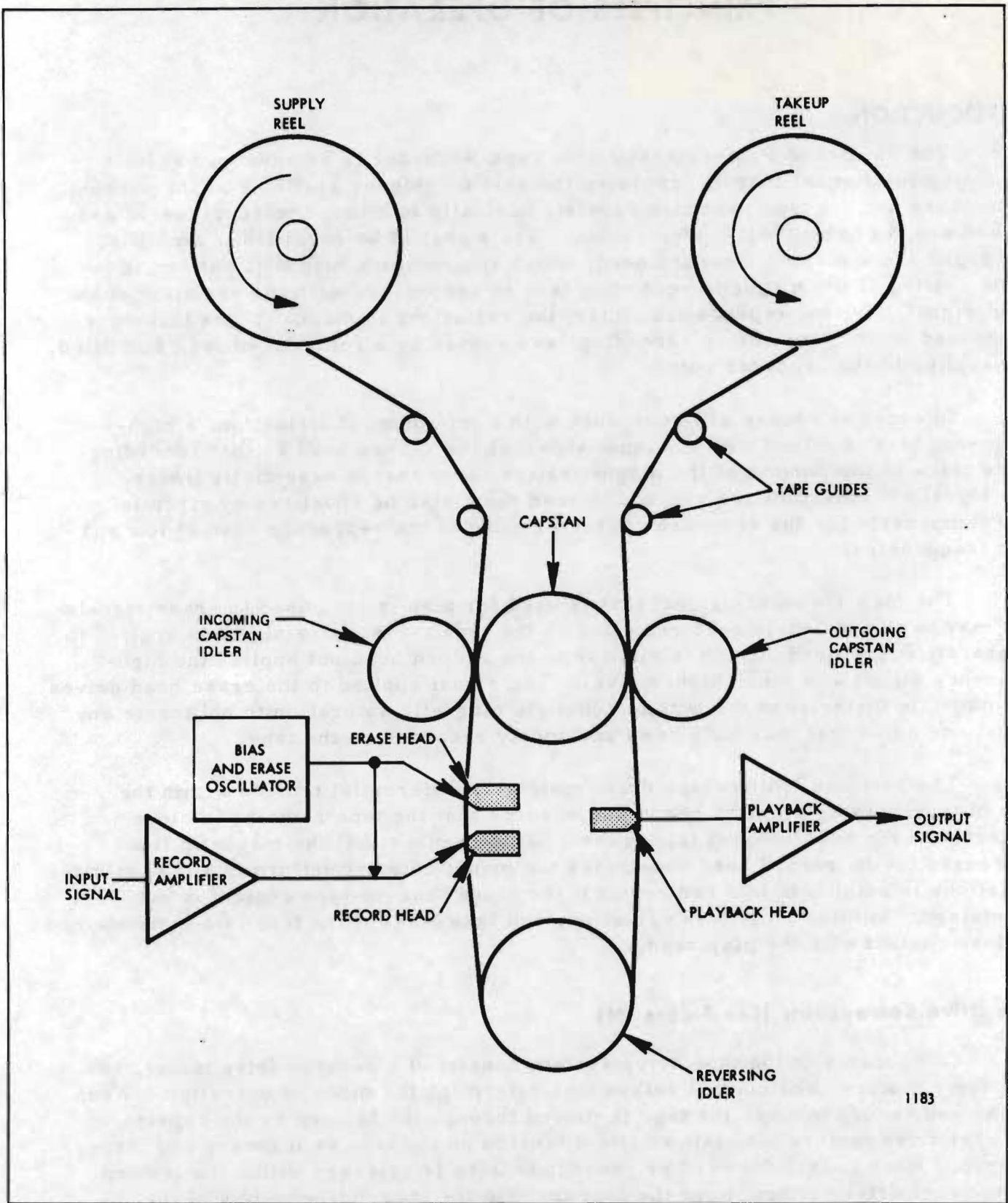
In order to record and reproduce with a minimum of distortion, a high-frequency bias is mixed with the input signal at the record head so that recording takes place in the portion of the magnetization curve that is essentially linear. The signal recovered by the reproduce head must also be equalized by circuits that compensate for the response characteristics of the reproduce head at low and high frequencies.

The high-frequency signal that is used for bias is also used to erase signals that may have previously been recorded on the tape. The erase signal is applied to a separate erase head, which is similar to the record head but applies the high-frequency signal at a much higher level. The signal applied to the erase head drives the magnetic material of the tape to complete magnetic saturation to obliterate any signal, or noise that may have been previously recorded on the tape.

The patented Isoloop tape drive maintains differential tension within the loop of tape passing over the heads and ensures that the tape remains in close contact with the heads during tape travel. This ensures that the magnetic flux impressed by the record head penetrates the oxide material uniformly and eliminates variations in amplitude that can result if the close head-to-tape contact is not maintained. Similar amplitude variations can take place if the tape is not maintained in close contact with the play head.

Tape Drive Components (See Figure 24)

Components of the tape drive system consist of a capstan drive motor, two reel drive motors, and control relays that determine the mode of operation. When in play and record modes, the tape is moved through the Isoloop by the capstan. The reel drive motors maintain constant tension on the tape as it enters and leaves the loop. When in fast-forward or rewind, tension is released within the Isoloop and the reel drive motors move the tape through the loop independently of the



1183

Figure 24. Tape Recorder, Block Diagram

capstan. Before entering and after leaving the Isoloop, the tape passes over stationary guides to ensure that it is properly aligned with the magnetic heads.

When the transport is in the play and record modes, solenoids press the capstan idlers against the tape, clamping it to the capstan to prevent it from slipping. The tape is moved past the income idler and capstan, past the erase and record heads, and around the reversing idler. From the reversing idler, it passes the play head, and the outgoing idler and capstan. During fast-forward and rewind, solenoid-actuated tape lifters hold the tape away from the tape so that signals on the tape will not be played back, which would cause an annoying squeal. The tape lifters are inactive in play, record, and stop modes.

The play head is enclosed in a magnetic shield to avoid pickup of noise from surrounding equipment and bias-frequency energy radiated by the erase and record heads. A solenoid-actuated cover is positioned over the tape as it passes the play head and serves to complete the shielding of the head. During fast-forward, rewind, and stop, the hinged cover is moved away from the head to allow the tape to be lifted by the tape lifters and allow easy threading of the tape. The cover is closed during play and record.

TAPE TRANSPORT CIRCUIT DESCRIPTIONS

The following circuit descriptions relate to figure 25 which must be used to follow the discussions. In the schematic, connector terminals are shown as small rectangles with the connector and terminal numbers inserted.

Power Circuits

A standard, three-wire power cable is provided, which must be connected at J1. The third, or ground, lead must be connected to a good earth ground; otherwise the recorder will not meet dynamic range specifications in regards to hum, harmonic buzz, or radio-frequency fields. The power is 105 to 125 volts, but 50 or 60 cycle models for the same voltage range are available and entail only a change of capstan motor characteristics. The schematic otherwise remains unchanged. For 220 volt operation an external line transformer must be used.

The POWER switch, S6, when operated, closes both sides of the input line activating a number of circuits. These are as follows:

1. Bridge rectifier CR46 through CR49 charges capacitor C65 through R60 approximately 165 volts in the absence of a load. This voltage is applied through J7-2 and J9-1 to the fields of the takeup and rewind motors. Field returns are through J7-1, and J9-2 through J6-4, and K1 contacts 6 and 10. Relay K1 operates as soon as power is turned on unless the transport has been previously threaded with tape.

2. Power is supplied from terminals J4-11 and J4-12 to the various electronics modules through an interconnecting cable.

P. 103A/
104A

3. Power is supplied to step-down transformer T60 from terminals TB3-2 and TB3-1. The low-voltage secondary feeds terminals J5-2 and J5-3. A full-wave bridge on the board, consisting of CR37 and through CR40 supplies charging current through terminals J5-5 and J5-1 to C66 and regulator transistor Q60. Zener Diode CR50 is supplied from R14 and establishes a voltage reference of 27 volts, applied through R15 to the base of amplifier transistor Q1. The collector of Q1 is directly coupled to the base of Q60 and the output collector potential of Q60 establishes the emitter voltage of Q1. The two transistors thus act to regulate the bus potential (approximately 26.5 volts). When power is applied the bus potential lights POWER indicator DS6, and the tape sensing lamp DS8. If fail-safe brakes are furnished, L6 operates to release them. As the solenoid approaches the end of its stroke, S15 is opened to reduce current in L6 by insertion of R73. Without tape on the machine, light from DS8 falls on photo sensor V60. The base of Q61 is thereby held near ground potential. The collector at Q61 is then at a relatively high potential causing Q62 to increase conduction. Current flows through Q62 to relay K1 through J6-7 to operate relay K1. Through K1 contacts 11 and 7, voltage is applied through J6-9 to J3-N, to light an indicator lamp on the Remote Control; if used, to show that the machine is on but inoperative due to the absence of threaded tape. The playback head shield cover door is caused to open through CR-25, J6-14, and TB1-1 with a return path through TB1-2. Also at this time, K1 contacts 12 and 4, and 11 and 3 are open and the 27 volt bus can perform no further function. Because of this, the machine may not be put into any mode of operation until tape is threaded on the machine.

4. A path is prepared through J5-F to J5-D and P11-2J to furnish power to the capstan motor, but this is kept open by K1 contacts 1 and 9 when tape is not threaded. The capstan motor is energized through J8-7 and S8 to either J3-8 or J8-4. The quadrature winding of the motor is supplied through C64 and R63 and through S8 to either J8-5 or J8-6. Motor return leads, depending on the speed selected by S8, are through J8-1 and J8-2, or J8-1 and J8-3 back to switch S6 through P11-J1. When power is supplied to the capstan motor it is also supplied to bridge rectifier CR42 through CR45. The dc output of the bridge is applied through J5-J, R68, and TB2-3 to a solenoid, which pulls the motor pulley physically into contact with the capstan flywheel tire. Return path of the solenoid is through TB2-2 and J5-7. Filter capacitor C68 prevents induction of hum from the solenoid into the playback heads.

5. Power is applied to J3-c and J3-d for application at the remote control position, if required.
6. The fan is normally connected across TB1-4 and TB1-6 where it is operated only when the capstan motor is running. By removing the fan lead on TB1-4 and connecting it to TB1-5, the fan will run whenever the power switch is on.

Threaded Tape Condition

When a reel of tape is placed on the supply hub, the free end is passed through the incoming side of the Isoloop, past the capstan and record head, and around the reversing idler, then between the outgoing side of the capstan and its idler. When the tape is dropped into position at this point, light is cut off from V60 causing relay K1 to release. CR-1 is a surge protective diode.

When K1 contacts 11 and 7 open, the head shield cover is closed because the door solenoid is released and the remote TAPE RUNOUT lamp goes out.

Closure of K1 contacts 11 and 3, and 12 and 4 applies bus potential through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3, and K5 contacts 12 and 4 through J5-14 to light STOP lamp DS3; and a path through CR13 and R5 charges C3, and operates K4. Several other paths are likewise made ready. Opening of K1 contacts 10 and 6 inserts R9 in the return path of the reel motor fields and the voltage developed across this resistor is applied through K5 contacts 1 and 9, K6 contacts 1 and 9, K7 contacts 1 and 9 through J6-A to the armature of the rewind motor. A similar path applies the same voltage to the takeup motor through K5 contacts 2 and 10, K6 contacts 2 and 10, K7 contacts 2 and 10, and J6-2. The torque so generated is very small; sufficient to remove slack from threaded tape but not enough to cause motion of the tape from a large-diameter reel to a smaller one. When the end of the tape is threaded into the takeup reel, the transport is ready to be put into motion from its standby condition.

From Standstill to Play

Bus potential exists on switch S5 through J6-D, J2-9, and J2-10. Closure of the PLAY pushbutton applies this through J6-18 and CR4 to operate relay K3 momentarily. Through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3, and K3 contacts 8 and 12, K5 is caused to operate. Release of the PLAY pushbutton releases K3 but K5 remains locked up through K5 contacts 8 and 12, K8 contacts 3 and 11, etc. PLAY lamp DS5 remains lit through J6-17 since it is in parallel with the coil of K5. This same supply immediately operates the ingoing capstan idler solenoid through TB2-1, clamping the tape gently, under control of a dashpot, to the capstan. The break at K5 contacts 12 and 4 removes bus voltage from C3 and the coil of K4 so that after approximately 0.5 second, K4 releases.

Closure of K4 contacts 11 and 3 applies bus power to J6-12 and TB2-3 and operates the outgoing capstan idler solenoid. This occurs after the tape has accelerated to running speed under control of the ingoing solenoid.

When K5 operates, the transfer of K5 contacts 2 and 10, to 6 and 10, applies full dc power through K4 contacts 6 and 10, K5 contacts 6 and 10, K6 contacts 2 and 10, and K7 contacts 2 and 10 to the takeup motor armature and a reasonably high hold-back torque to the supply motor through K4 contacts 6 and 10, R8, K5 contacts 5 and 9, K6 contacts 1 and 9, and K7 contacts 1 and 9. After the tape is up to speed and K4 released, the break at K4 contacts 6 and 10 inserts resistors R61 and R62 in the armature paths to establish proper winding and holdback torques since acceleration conditions are replaced by constant-velocity operation.

From Play to Stop

Directly beneath the takeup reel hub on the takeup motor shaft is mounted a ball bearing. The outer race of this bearing is not rigidly mounted but is centered in a light-weight vane. The vane would rotate with the takeup motor shaft but is prevented from doing so by two posts. The vane rests against one post when the motor turns in one direction and shifts through an angle of about 15 degrees to rest against the other post when the motor turns in the other direction. The vane carries a small magnet, which causes operation of reed switch S13 when the motor runs in the forward direction. Switch S13 is released and S14 is caused to close when the motor turns in the reverse direction.

With the machine in the play mode, if the STOP pushbutton is pressed, the following takes place: Bus voltage is applied from K3 contacts 10 and 2 through J6-11, J2-12, J2-11, and the closed contacts of S3, through J6-8 to operate relay K8. Bus power from J6-D is applied through S13, which is closed in the forward direction, through J5-18, K8 contacts 6 and 10 to operate K7. Relay K7 closes a holding path for relay K8 through K7 contacts 12 and 8, K8 contacts 8 and 12, to K8 terminal 14, so that K5 and K6 both remain operated after pressure is removed from S3. The REWIND lamp is lit through K7 contacts 11 and 7. The break at K8 contacts 3 and 11 opens the holding circuit for K5 and it releases, extinguishing the PLAY lamp and dropping out the capstan idler solenoids so as to unclamp the tape from the capstan. Operation of K7 provides full torque power through K7 contacts 5 and 9 and through J6-A to the rewind motor, while the break at K7 contacts 2 and 10 removes all takeup motor torque, bringing the tape to standstill and attempting to start it in the reverse direction. Motion of the tape in the opposite direction, however, causes the vane in the sense switch assembly to leave its former position against the forward stop and swing toward the reverse stop. When the magnet moves away from S13, this switch opens, dropping out K7. This applies a light holding torque to the tape. When K7 releases, it releases K8 by opening K7 contacts 7 and 11. Relay K4 is held closed through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3, K5 contacts 12 and 4, CR13 and R5. It was previously operated through K7 contacts 12 and 8, CR14 and R5. With the exception of K4, all relays are de-energized and STOP lamp DS3 is lit.

From Stop to Rewind

With the machine in standby, pressing REWIND pushbutton S2 causes bus voltage to be applied through K3 contacts 10 and 2, J6-11, J2-12, J2-11, S3, S2, J5-R, and K8 contacts 2 and 10 operate K7. The relay applies rewind torque through K7 contacts 5 and 9 as outlined above, and K7 locks up to the power bus through K7 contacts 11 and 7, and K8 contacts 2 and 10. The tape accelerates in the rewind direction with full power on the armature of the rewind motor. Since this is a dc shunt motor, it would reach a certain terminal velocity at which time tape would be loosely wound except for the following feature. As the tape comes up to speed in rewind, the armature of the takeup motor is open circuited because of the break at K7 contacts 2 and 10. It operates as a dc generator without load until a definite terminal voltage is reached, the voltage rising as the speed increases. Zener diode CR53 will not pass current until the potential across it reaches 75 volts. Therefore, when the generated voltage reaches this level, current flows through J9-4, J6-S, CR32, CR53, J6-2 and J9-3 to act as a load and effective brake on the takeup motor, limiting the maximum speed at which it will supply tape and thereby providing a controlled tension in the reel being filled. Closure of K7 contacts 12 and 8 provides a path through CR24, J6-14, and TB1 to open the head shield door and through J6-15 to operate the tape lifters.

From Rewind to Stop (Tape Moving in the Rewind Direction)

Pressing STOP switch S3 operates relay K8 through K3 contacts 10 and 2, J6-11, J2-12, J2-11, S3, and J6-8. Since tape is moving in the rewind direction, the sense switch vane has caused S13 to open and S14 to close. Therefore, K6 is caused to operate through J6-D, S14, and K8 contacts 5 and 9. Relay K8 is locked up through K6 contacts 11 and 7, K8 contacts 8 and 12, and K6 is held up by S14. Relay K7, however, is released by the break at K8 contacts 10 and 2 and the fact that S13 is open. The power that was supplied to the rewind motor through K7 contacts 5 and 9 is removed by its release and transferred through operation of K6 through K6 contacts 6 and 10 to the takeup motor, which now operates to bring the tape to standstill and attempts to reverse it to the forward direction.

As soon as the sense switch vane moves away from S14 toward S13, S14 opens releasing K6 and placing all circuits in the standby condition. During the stopping interval, the REWIND lamp goes out and the FORWARD lamp is lit from release of K7 and operation of K6. In standby, the tape lifter solenoid is released and K-8 is released by the break at K-6 contact 7 and 11. The head cover door remains operated through S-12, J6-M and CR-26 unless manually overridden to break S-12. Relay K4 remains energized throughout the above action, either through K7 contacts 12 and 8, CR14; or through K6 contacts 11 and 7, CR14; or through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3 and K5 contacts 12 and 4 and CR13.

From Rewind to Stop (Tape Moving in Forward Direction)

It is possible while shuttling the tape at high speed to have the tape moving in the forward direction but to have the controls in the rewind mode. If the STOP pushbutton is pressed at this time, K8 is energized in the manner described above; however, K7 is not released in favor of K6 because the sense switch vane is in position to cause S13 to be closed and S14 open. Thus K7 remains energized and the tape comes to standstill and attempts to reverse at which time the sense switch opens S13, releasing K7 and putting the machine in standby. At this time the tape lifters are released and K8 is released by the break at K7 contacts 8 and 12. The door solenoid remains energized through S12 unless overridden manually to break S12.

From Stop to Forward

With the machine in standby, pressing the FORWARD pushbutton causes bus voltage to be applied through K3 contacts 10 and 2, J6-11, J2-12, S3, S2, S4, J5-S, CR17 and K8 contacts 1 and 9 to operate K6. Relay K6 applies full torque to the takeup motor through K6 contacts 6 and 10, K7 contacts 2 and 10, J6-2, and J9-3, causing tape to accelerate in the forward direction. Relay K6 locks up to the power bus through K8 contacts 9 and 1, K6 contacts 8 and 12, and K7 contacts 3 and 11. Motor speed is limited by the action of Zener diode CR52 as described before.

Closure of K6 contacts to 11 and 7 provides a path through CR24 to open the head shield door and through J6-15 to operate the tape lifters.

From Forward to Stop (Tape Moving in Forward Direction)

Pressing STOP switch S3 operates relay K8 through K3 contacts 10 and 2, J6-11, J2-12, J2-11, S3 and J6-8. Since tape is moving in the forward direction, the sense switch has caused S13 to be closed and S14 to be open. Thus, K7 is operated through J6-D, S13, J5-18, and K8 contacts 6 and 10. Relay K8 is locked up through K7 contacts 12 and 8, and K8 contacts 8 and 12. Relay K6, however, is released by the break at K8 contacts 9 and 1. The power that was supplied to the takeup motor through K6 contacts 6 and 10 is removed by its release and transferred through closure of K7 contacts 5 and 9 to the rewind motor, which now operates to bring the tape to standstill and attempts to reverse it to the rewind direction. As soon as the sense switch moves by reversal of tape motion, it releases S13, releasing K7 and placing all circuits in standby. During the stopping interval, the FORWARD lamp goes out and the REWIND lamp lights because of the release of K6 and operation of K7. In standby, the tape lifter solenoid is released. K8 is released by K7 contact 8 and 12. The door solenoid remains energized through S12 unless manually overridden to break S12.

From Forward to Stop (Tape Moving in Rewind Direction)

It is possible, while shuttling tape at high speed, to have the tape moving in the rewind direction but to have the controls in the forward mode. If the STOP button is pressed at this time, K8 pulls in in the manner described above. However, K6 is not released in favor of K7 because S14 is held closed by the sense switch vane while S13 is open. Thus, K6 remains operated and the tape comes to standstill and attempts to reverse, at which time the sense switch opens S14, releasing K4 and putting the mechanism in standby. At this time the lifter solenoid is released, and K8 is released by the break at K6 contact 7 and 11. The Door solenoid remains operated through S12 unless manually overridden to break S12.

From Forward to Rewind

Considering the tape to be in the forward mode regardless of its actual direction, relay K6 is energized. Pressing the REWIND pushbutton closes a circuit to operate K7 through K3 contacts 10 and 2, J6-11, S3, S2, J5-R, K8 contacts 2 and 10 to K7-14 through K7-13, CR19 and R6 to ground. Relay K7 operates, opening the holding path for K6 at K7 contacts 3 and 11, which releases, further breaking its holding circuit at K6 contacts 8 and 12. Torque power to the reel motors is therefore reversed. Relay K7 locks up through K8 contacts 10 and 2, and K7 contacts 7 and 11.

From Rewind to Forward

Considering the tape to be in the rewind mode regardless of its actual direction, relay K7 is energized. Pressing the FORWARD pushbutton closes a circuit to operate K6 through K3 contacts 10 and 2, J6-11, J2-12, J2-11, S3, S2, S4, J5-S, CR17, and K8 contacts 1 and 9 to K6-14. Because J5-S applies bus potential to CR20 as well as to CR17, the coil of K7 is effectively shorted, since the total voltage appears across R6. This releases K7, K6 remains operated over the path K7 contacts 11 and 3, K6 contacts 12 and 8, and K8 contacts 1 and 9. Torque to the reel motors is therefore reversed.

From Rewind to Play

In the rewind mode, regardless of actual direction of tape motion, relay K7 and K4 is energized. Pressing PLAY pushbutton S5 causes bus power to flow through J6-D, J2-9, J2-10, S5, J6-18, and CR4 to operate K3. A holding path is established through K7 contacts 12 and 8, K3 contacts 11 and 7, R1, CR8 and CR7 so that K3 will not release when S5 is released. Relay K3 contacts 10 and 2 open the paths to S3, S2 and S4 pushbuttons to render them inactive at this time. The potential from K7 contacts 12 and 8 through K3 contacts 11 and 7, and through R1 also feeds through CR9 to terminal 14 of K8 causing it to operate. Because this action opens the holding path of K7 through K8 contacts 10 and 2, and K7 contacts 7 and 11, an unstable condition could arise, but this is prevented by the charge in C12, which continues to hold K8 until the transfer of K7 is completed if need be. Whether K7

continues to hold or to transfer to K6 is determined by the direction the tape is moving as outlined above. In any event, operation of K8 functions to bring the tape to standby condition. When K6 or K7 is released by the sense switch as the tape reaches standstill and attempts to reverse, the break at K6 contacts 7 and 11 or K7 contacts 8 and 12 releases K8. Normally, the machine would now remain in standby, but at this time K3 is still operated even though its supply path through K3 contacts 7 and 11 is open. This is because it is held by the charge in C1 for sufficient time to perform an additional function. When K8 releases, bus power is supplied through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3, and K3 contacts 8 and 12 to operate K5. The functions from here on are as described under "From Standstill to Play."

From Forward to Play

In the fast-forward mode, regardless of actual direction of tape motion, relay K6 and K4 is energized. Pressing PLAY pushbutton S5 causes bus power to flow through J6-D, J2-9, J2-10, S5, J6-18, and CR4 to operate K3. A holding path is established for K3 through K6 contacts 11 and 7, K3 contacts 11 and 7, R1, CR8, and CR7 so that K3 will not release when S5 is released. Relay K3 opens the paths to S3, S2, and S4 pushbuttons to render them inactive at this time. The potential from K7 contacts 12 and 8 through K3 contacts 11 and 7 and R1 also feeds through CR9 to terminal 14 of K8 causing it to operate. Because this action opens the holding path for K6 through K8 contacts 9 and 1 and K6 contacts 8 and 12, an unstable condition could arise but is prevented by the charge in C12, which continues to hold K8 until the transfer of K6 is completed, if need be. Whether K6 continues to hold or to transfer to K7 is determined by the direction of tape movement. In any event, operation of K8 functions to bring the machine to a standby condition. When K6 or K7 is released by the sense switch as the tape reaches standstill and attempts to reverse direction, the break at K6 contacts 7 and 11, or K7 contacts 8 and 12, releases K8. Normally, the machine would now remain in standby but at this time K3 is still energized even though its supply path through K3 contacts 7 and 11 is open. This is because it is held by the charge in C1 for sufficient time to perform an additional function. When K8 releases, bus power is supplied through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3, and K3 contacts 8 and 12 to energize K5.

Tape Runout

When the tape runs out from any mode of operation, the light from lamp DS8 falls upon photo diode V60, causing K1 to energize. This action opens the bus supply to all other relays. All power is therefore removed from the armatures of the take-up and rewind motors. A short circuit is applied to the armature of each motor. One such circuit is through J9-4, J6-S, K1 contacts 10 and 6, J6-4, J2-1, J2-2, J5-P, K5 contacts 2 and 10, K6 contacts 2 and 10, K7 contacts 2 and 10, J6-2 and J9-3. The other circuit is through J7-4, J6-S, K1 contacts 10 and 6, J6-4, J2-1, J2-3, J5-V, K5 contacts 1 and 9, K6 contacts 1 and 9, K7 contacts 1 and 9, J6-A, and J7-3. Since the fields are fully excited, this system acts to brake the motors to a standstill since they operate as dc generators operating into a short circuit.

Record Mode Operation

The record mode can be selected only when the PLAY lamp is lit, indicating that the machine is running at normal speed. It is then necessary to press both the RECORD and RUN pushbuttons simultaneously. Bus power is applied through J6-D, J2-9, J2-10, S5, S1, J5-13, and K3 contacts 7 and 11 to operate K2, which then locks up to the holding path for K5. This path is K5 contacts 8 and 12, and K2 contacts 8 and 12. The path established to hold K2 then lights DS1 through J6-3 and supplies positive bus voltage to the electronics power cable through connector J4-9. Relay K2 contacts 11 and 7 also supply ground potential to the same connector through J6-T to J4-10. The positive potential is also applied through R16 and CR29 to the bias oscillator. Capacitor C7 is provided both for decoupling and for delayed decay after power is removed. Transistors Q2 and Q3 operate as a low power, push-pull oscillator to provide a high-frequency signal to terminals J6-U and J6-V. The electronics assembly cable conducts high-frequency bias to all bias boards in the electronics through J4-1 and J4-2. The oscillator is tuned to 120 kHz by capacitor C11.

Speed Change Switch

Speed change switch S selects windings of the capstan motor to provide either of two speeds. These are related by the ratio 2:1 and therefore can be provided for tape speeds of 7-1/2 and 15 ips, or 15 and 30 ips. Dc bus potential is supplied to either J4-6 or J4-7 in the electronics power cable, depending on the motor speed, in order to control equalizer-select relays in the electronics circuit boards.

Reel Size Switch

Reel size switch S7 provides for adjustment of torque in fast forward or in rewind when one spindle carries the normal large reel and the other carries a light-weight reel. If both reels are the same size, the switch is left in the center BALANCE position. If the large reel is on the tape takeup side, the switch is moved toward the right, or toward the large reel (in the direction of the arrowhead on the panel). If the large reel is on the left, or supply side, the switch is moved to the left. In the center position, S7 connects J5-N to J6-1 and J5-15. If K6 is energized, putting the machine into fast forward, heavy dc current flows through the takeup motor, returning to the negative supply through R60. Thus J5-L is a few volts more negative than J6-S. This negative potential is applied through CR30, S7, and R11 to the rewind motor, causing it to develop small torque in the same direction the takeup motor tends to turn. This aids acceleration. Similarly, in rewind, R10 supplies reverse torque to the takeup motor, assisting in getting the tape up to high speed. When a small reel is on one side, however, this assistance is not desirable since it may tend to unwind tape faster than the other

reel can spool it. Thus S7 provides for breaking the negative line through R10 or R11 as needed. This feature is only applicable to 1/2-inch machines. The switch, although provided, is inactive in 1/4-inch machines.

TORQUE CONTROL RELAY (1/4-inch machines only)

Due to the light weight and inertia of the small plastic reels commonly used on 1/4-inch machines, there is a tendency for a loop to form in the tape between the outgoing tape guide and the reel receiving the tape if negative torque is applied through R10 or R11 before the tape has come to rest and started to move in the opposite direction. To prevent reverse torque from being applied until the tape has begun to travel in the direction of the selected mode, K13 is installed in the socket provided on the transport near the rewind motor. Reel size switch S7 is not connected as stated above.

Consider the tape to be in motion in the fast forward direction with K6 energized. Pressing the REWIND pushbutton energizes K7 and releases K6. Drive torque is immediately transferred from the take-up motor to the rewind motor. Due to the momentum of the reels traveling in the forward direction, the tape does not come to an immediate stop but continues to travel in the forward direction until this momentum is overcome by the dynamic braking action caused by the reverse torque applied to the rewind motor, which is attempting to pull the tape in the opposite direction. During this slow down period, directional sense switch S14 is open, which maintains K13 in the deenergized position. Therefore, the circuit path to the take-up motor armature is broken at K13 contacts 5 and 9, causing the motor to coast to a stop under the braking action of the rewind motor only. As the tape motion comes to rest and starts to reverse its direction, S14 closes. Buss power is applied to K13, providing negative torque power through contacts 5 and 9, R10, etc., to the take-up motor and causing it to turn in the same direction as the rewind motor. This action reduces the drag on the rewind motor and aids acceleration as described under "Reel Size Switch." Thus, K13, in conjunction with directional sensing switch S14, prevents negative torque power from being applied to the appropriate reel motor until the tape has come to rest and starts to accelerate in the opposite direction.

Monitor Switching

Two pushbuttons on the transport, S10 and S11, are arranged to transfer the output line amplifier and VU meter of each electronics circuit board from the incoming signal source to the playback and vice versa. Pressing A switch S10 applies bus voltage from J6-D through J2-9, J2-10, and S10 to J4-5, which is in the electronics power connector, causing operation of transfer relays in each module. Similarly B switch S11 applies bus potential to terminal J4-4 to cause reverse operation of the transfer relays. These switches are momentary-contact types and are not lighted.

Runout Switch

The runout switch is provided but not used on this recorder.

Fail-Safe Brakes

For certain applications, it is desirable to include self-energizing mechanical brakes on the transport to prevent a tape spill if power fails. The fail-safe brakes, which are provided on special order, are released whenever power is on and are applied when the machine is turned off or power interrupted. Solenoid L6 is energized directly from the low-voltage dc supply. When it operates to lift the brakes, microswitch S15 is opened, inserting 150-ohm resistor R73 into its path to prevent overheating of the solenoid winding.

SIGNAL ELECTRONICS FUNCTIONS

Signal electronics consist of record amplifiers, which raise the input signal to a level required by the record (heads), a bias and erase frequency power supply, and equalizer circuits and amplifiers to reproduce the signal recovered by the playback heads. Each complete electronics assembly includes a power supply and controls.

Signal processing is in conformance to NAB standards. The overdub feature allows a record head to be used as a playback head so that a second track can be recorded in synchronism with a pre-recorded signal. This feature avoids the time lag that would occur if the playback head were to be used for monitoring during overdub operation.

NAB ELECTRONICS

One electronics module is employed for each compatible NAB equalized track. Thus, in a 1/2-inch machine having standard four track heads four channels of NAB equalized signals may be recorded. In this case four electronic assemblies are required, equipped with the proper board for NAB service. The following describes the operation of a complete electronics assembly arranged for NAB service.

The individual plug-in boards will be fully described after an outline of their function in relation to their service in the overall operation. Refer to figures 31 and 32 during the following discussion. The rectangular dashed areas represent plug-in units. The numbers in ovals represent connector pin numbers.

NAB Recording

The signal to be recorded is applied through connector J101 to the primary of transformer T1, which reflects an impedance of 20,000 ohms to the signal source. Input is through a two-wire shielded cable with the signal lines ungrounded. The secondary of T1 is connected across RECORD LEVEL control R100, which establishes the level of the signal applied to the record amplifier. This amplifier

provides pre-emphasis, equalization, and linearization to the signal, and sufficient gain to drive the record head. A relay on the board selects equalization networks for the two tape speeds used. Linearization is selectable by means of a switch on the circuit board and is adjustable. The degree of linearization required depends on the signal level, and corrects for distortion that occurs as the signal level approaches the saturation level of the tape.

A pilot tone, used for tape-speed control, may be introduced by way of connector J111-1, and terminal 16 of the NAB Record Board, to be mixed with the normal input signal. The pilot tone may be either supersonic or subsonic.

A separate amplifier is included on the NAB Record Board to bring the input signal to sufficient level to apply to the monitoring circuits so that this signal may be listened to and observed on the VU meter. A variable control RECORD MON. CAL. enables the meter to be adjusted so that, without the linearizer in service, 3% total harmonic distortion on playback results at 6 dB above zero VU.

The main signal from the record board appears on the record relay K101 at terminal 9. It is normally grounded through K101 contact 9 and 1 but when K101 is operated the signal is applied through K101 contact 9 and 5 to the H Bias and Erase Board (1) in slot 1. Whenever the RECORD button on the transport is activated, an oscillator in the transport is energized and provides 120kHz from J110 terminal 1 and 2 to terminals 14 and 15 of this board and all other identical boards in the other electronic assemblies of a multi-channel recorder. A power amplifier feeds the 120 kHz bias signal through a variable resistor BIAS AMP to provide the proper magnitude of bias to the record head through terminal 1. The audio signal from terminal 22 is also passed to terminal 1 through a bias trap circuit which has no effect on the audio signal, but prevents drainage of bias power back through the record amplifier board. A noise balance control is provided which injects an adjustable DC component into the record head to correct for external fixed magnetic fields in the vicinity of the record head gap.

In order to monitor the bias and audio signal mixture by means of an oscilloscope or vtvm, the record head is returned to terminal 2 which is removed from ground by 10 ohms. Monitoring is at the TP BIAS test point and a variable control permits the VU meter, when connected to terminal 3, (set to BIAS) to be calibrated to a fixed number on its scale (-5 VU for example).

A second power amplifier, also driven by the 120 kHz signal, applies its output through terminal 21 to terminal 20 of the NAB Erase Coupler Board (3N) in slot 3. The signal passes through an adjustable capacitance to terminal 11, and from there to the erase head. There is a feedback path through board 3N terminal 19, and board 1 terminal 19, to control the amount of drive of the erase amplifier. The amount of feedback is controlled by the feedback resistor. The amplitude of the erase current may be monitored at the TP. ERASE test point on board 3N. The VU meter may be calibrated by variable resistor ERASE MON. CAL. which is feeding via terminal 22 to the VU monitor. Typical calibration provides 0 VU when erase current is adequate.

In addition to transferring the record amplifier output from ground to the bias amplifier board, relay K101 also causes indicator lamp DS103 to light through contacts 12 and 8 and applies +28 volts to energize the bias and erase amplifiers at terminal 12 on the Bias and Erase board (1). Inductive surge from the coil of K101 is suppressed by diode CR101.

NAB Reproduction

Signals recorded by the NAB record circuits described above are reproduced from the corresponding playback head and applied to the NAB pre-amplifier board in slot 7. The preamplifier board contains high-frequency and low-frequency amplitude equalizers for two tape speeds. The proper equalizers are selected by a relay on the board, which is energized by a voltage introduced through terminal 20. High-frequency and low-frequency equalizer networks are provided for each tape speed. Phase correction networks are selected by another relay with a separate network for each speed. This relay is energized by a voltage introduced through terminal 19. The phase correction networks are not adjustable.

At the pilot connector J111 all signals may be fed out on terminal 2 with return on 5, in order that the pilot, if any, may be extracted free from gain variations occasioned by adjustment of the GAIN CAL. potentiometer which feeds the main audio signal out on terminal 22.

When the REC. SELECT switch is in the RDY position, the record head is connected to the output of the bias and erase board; +28 volts is supplied from the power and meter assembly in slot 5 through terminal 12 to this switch, to terminal 13 of the record relay so that it may be operated by grounding its terminal 14 through diode CR102; and to terminal 10 of J110 at the tape transport.

The signal from terminal 16 of slot 8 is routed through the REC. SELECT switch to the REPRO. LEVEL control and an attenuator comprising R104 and R105. With the METER switch in the CAL. position, the signal from the attenuator is routed to the line amplifier circuit card in slot 6, where it is amplified and applied to the outgoing line. A selector switch at the output of the line amplifier normally connects the output through terminal 21 to transformer T2, which is provided with impedance matching resistors R108 and R109. The output impedance may be set by means of switch S106 to 150 or 600 ohms. Switch S105 is a three position switch providing 150-ohm, or 600-ohm termination of the outgoing line when it is not terminated externally. The outgoing line connects to connector J102. When the selector switch at the amplifier output is set to route the signal to terminal 20, an 8-ohm loudspeaker may be driven directly from terminal 3 of PILOT connector J111. Speaker return is to terminal 6. Earphone monitoring is provided by jack J103. This jack is "floating" and headphone leads should not be grounded. The output signal from T2 is applied through terminals 2 and 4 of the line amplifier board to an attenuator which supplies the attenuated signal for the VU meter through terminals

3 and 4, through the METER switch to terminals 7 and 4 of J109, the input to the VU meter. Resistors in the attenuator may be changed to modify the working level from the +4 dBm normally provided. See table 10. Choice of 150-ohm or 600-ohm output does not appreciably modify the VU meter reading.

Since the meter attenuator is fixed for any given operating line level, and the fixed gain attenuator R104 and R105 is selected in the CAL. position of the METER switch, it is only necessary to adjust the GAIN CAL. potentiometer on the playback preamplifier board (7/9) to assure that a standard reference level tape is reproduced at the proper indicated level. Typically, such tapes provide a reference tone of 700 cycles which should read zero VU, attainable by adjustment of this control.

Having been so calibrated, the METER switch may be turned to the SIGNAL position. The REPRO. LEVEL gain control is then substituted for the calibrated attenuator, to provide convenient adjustment of playback level. When in this position, the signal output may be either the tape playback or the input signal. This transfer is provided by K102 contacts 8, 4, and 12 under control of pushbuttons S101 and S102, the A-B output selectors.

Note that when the METER switch is in the SIGNAL, ERASE, and BIAS positions, the audio signal is always fed in the same manner to the output, although the meter is connected to various circuits.

The Power Assembly, located in slot, 5, is powered from the transport through J110 terminals 11 and 12 to terminals 5 and 20 for two track recorders. Power for the 4 track recorders is from a stepdown transformer to terminal 7 (28 VAC in). It provides regulated +28 volts at terminal 12 for all electronics. Non-regulated dc is provided at terminal 18 to power the coil of K102 and the A and B lamps.

One position of the REC. SELECT switch, S103, has been discussed, the RDY. position. In the SAFE position, the coil of K101 is opened so that the record electronics are locked off to provide maximum protection for previously recorded tapes. All other circuits remain normal. In the O. DUB position, the record head is completely disconnected from its normal feed and becomes a playback head.

When the record head is so connected, it feeds terminals 10 and 14 of the preamplifier (7/9) in slot 9. When the record head is used in playback, it matches closely the frequency response and gain of the normal playback head. Due to its wider gap, however, the extremely high frequencies suffer some attenuation depending upon the tape speed.

It is highly recommended that a separate preamplifier be employed in each position; a 7/9 board in slot 7 and a 7/9 board in slot 9.

DETAILED CIRCUIT DESCRIPTIONS

The following paragraphs contain detailed descriptions of each of the circuit boards, and the Power Supply Assembly.

NAB Record Amplifier (4) (See Figure 32)

The input signal to be recorded is applied at terminal 14, after it has passed through the input transformer and level control. C1 couples it to Q1, which is biased to the proper operating point by R1 and R2. After amplification the signal is coupled by C3 to an equalizer network, producing a preemphasis characteristic at the high and low frequency extremities of the spectrum in accordance with standard NAB practice. This is accomplished as follows.

Consider R6 and R7 as an attenuator network, with R8 short circuited, as it effectively is at high frequencies because of C4 and C5. This attenuator network reduces the voltage swing at the junction of R6 and R7 from what it was at collector of Q1. However, if a bypass capacitor C18 or C19 is connected across R6 it permits the high frequencies to suffer less attenuation. The degree to which this is true depends on the setting of the variable capacitor. Practical values of C18 and C19 make it necessary for the junction of R6 and R7 to appear always as a very high impedance. Current cannot be drawn from this point without upsetting the equalization characteristic. Thus, the junction is used to drive a field effect transistor, Q2. C4 and C5 show increasing impedance as the signal frequency is lowered; therefore, the voltage at the junction of R6 and R7 would continue to rise as the frequency drops, except that R8 provides a shelving off to prevent unnecessary sensitivity to subaudible frequencies.

Relay K1 automatically changes the high frequency equalization when tape speed is changed. The output of Q2 is applied to terminals into which may be inserted values of C8, C20, R11, and R12 to adjust for any requirement arising for shelving equalization in addition to the normal NAB equalizers just described. All four components may be eliminated in many instances, a jumper being furnished across the R11 or C20 terminals.

After this network the signal is fed to the base of Q3 whose bias is set by R13, R14, and R15. This operates with Q4 in a Darlington circuit to provide gain and low impedance output at C11 to drive the NAB record head. R18 normally provides a degree of degeneration, determined by the setting of R20, and R19 in series with C12, and C21. But the degree of degeneration can also be reduced by conduction of Q5 and Q6 when S1 is closed. Q5 and Q6 act to change the degeneration with instantaneous signal amplitude, thus they tend to deform the signal whenever its amplitude attains a value sufficient to overcome their contact potential. This results in a distortion, inverse to that which overload of the tape normally introduces. By employing Q5 and Q6 in this manner, and properly adjusting the overall degeneration by means of R20, the LIN ADJ. control it is possible to introduce the proper corrective distortion into the recording process so that the normal 3% tape distortion point shows somewhat less than 1%.

C11 feeds the record head connected at terminal 22. R22 is a resistor in series with the head to establish a constant current characteristic. R23 provides a high resistance path to ground so that the ground side of C11 will always be discharged, even when no head is connected to terminal 22. This is a means of preventing accidental record head magnetization.

The signal effective in driving the record head may be extracted at terminal 2 to be applied to the L track record amplifier when the Dynatrack system is employed.

Terminal 16 provides a point for injecting a pilot frequency for playback tape speed control. This is useful in motion picture synchronization. The pilot for either a high or low frequency system may be employed. C14 couples the input signal to Q7. The gain of Q7 is adjusted by the combination of emitter resistors R27 and R28, which is bypassed by C16 to provide the proper range of signal levels to R30. This control, RECORD MON CAL., can be conveniently adjusted to serve the input signal audio monitoring and input signal VU meter monitoring circuits. R29 and C17 are provided to give a slight rise in output at 15 Hz to make up for losses in the input transformer, wiring, and meter sensitivity occurring at the extreme end of the spectrum.

Bias and Erase Amplifier (1) (See Figure 30)

Whenever the transport is put into the recording mode, a 120 kc signal is generated within the transport, and applied to all electronics assemblies where it appears on terminals 14 and 15 of each Bias and Erase Amplifier. T1 operates as a bridging transformer. It has two secondaries. One of these feeds the base of Q2 through resistor R4. This resistor is employed to permit insertion of a feedback signal from R26. Q1 amplifies the 120 kHz signal and provides sufficient power to drive the push pull amplifier Q5 and Q6. C13 and C14 tune the secondary of T4, and C16 and C17 tune the primary of T5 in order to minimize harmonic distortion. Even order harmonics are particularly objectionable since they result in increased background noise recorded into the tape.

The output of Q5 and Q6 is fed through T5 and C18 to R19 and R24, the latter variable to control the amount of 120 kHz bias signal fed through terminal 1 to the record head. The audio signal comes from the record amplifier and is applied at terminal 22. It passes without loss through the tuned circuit L2, C19, and C21 since this is only tuned to present a high impedance to 120 kHz, thus preventing loss of bias power back into the record amplifier.

CR2 and CR3 each operate as half wave rectifiers. If the arm of R23 is run to the end connected to CR2, then the upper end of R21 will have an average negative potential. Conversely, if the arm is run to the other end, then the upper end of R21 will have an average positive potential. R20 allows current set up by such potential to flow through R19 and R24 to the record head, thereby making it possible to inject a very small but adjustable DC current into the head in addition to the audio and bias frequencies to allow minimization of noise resulting from strong external magnetic fields or even order harmonic distortion from the bias supply.

These circuits are activated by application of potential at terminal 12. In order to prevent a recorded thump when the record button is depressed, R27 and C20 are provided to permit the DC bias on the base of Q1 to rise slowly, and C15 is provided across R17 for the same purpose on Q5 and Q6. The bias envelope therefore grows to operating level in a matter of about 10 milliseconds. When the recording mode is deactivated another thump or click is avoided by allowing reservoir capacitor C2 to permit the bias waveform to decay to zero over a period of about 60 milliseconds. R1 allows C2 to charge at a reasonable rate when the circuits are activated without causing a surge on the power supply, but CR1 permits the capacitor to be connected directly to the load during discharge. L1 and C1 constitute a filter to stop bias frequency ripple on the power bus connected to terminal 12.

The amount of drive applied to Q5 and Q6 is controlled by feedback resistor R26, which also improves the waveform at the output by cancelling out internally generated distortion products.

The second winding of T1 feeds the 120 kHz signal to an almost identical circuit except that the output transistors Q3 and Q4 have a higher power rating in order to supply the erase head with sufficient drive to completely erase a saturated tape. The description above applies except for a few points. Potentiometer R3 is a variable resistor to allow setting the erase amplitude to the minimum that will allow sufficient erasure (70 to 75 dB). Erase current is monitored across the 10 ohm resistor R29 between terminals 16 and ground. The bias current is monitored from terminal 2, the record head return lead to ground, with R25 providing the meter calibration. This current is read on the meter when the meter switch is in the BIAS position.

Meter calibration for the monitoring taken across R29 is accomplished by potentiometers R3 on the 3N board. The reading is obtained by putting the meter switch into the ERASE position.

Preamplifier (7/9) (See Figure 35)

This plug-in printed circuit board assembly installed in slot 7 for normal playback provides the required signal amplification of the playback head signal to drive the output line amplifier. In addition, the assembly performs the necessary frequency equalization and phase correction for two tape speeds. When this PC board is installed in slot 9, the signal from the record head is used as the input to provide overdub.

The playback head is connected to the assembly through terminal 4 which provides the signal path through C1 and R2 to the base of Q1, the first amplifier stage. In the overdub mode (slot 9), the record head is connected via the READY/SAFE/OVERDUB switch to terminals 14 and 17 and the primary of T1. The secondary of terminal 16 is connected externally to terminal 4 which provides signal in the same manner as previously described for the playback head.

R8 and R9 in the emitter circuit of Q2. This dc bias is applied through R5 to the base of Q1, thus providing a controlled amount of negative feedback to Q1 in relation to the input signal level. C4 filters out any ac component present at the junction of R8 and R9.

Q3 operates as a phase distortion correction stage. Considerable rotation of phase normally occurs in the overall process of recording and playing back tape, the situation being increasingly pronounced at shorter wavelengths. In copying tapes, the effect is compounded. Q3 and its associated circuits provide an effective correction for such distortion.

A paraphase signal output condition exists between the emitter and collector of Q3; that is, equal amplitude with 180 degree phase difference. C5, which couples the collector signal to the base of Q4, presents a high impedance to the low frequencies contained in the recorded signal. R13 (or R13 in series with R14, depending upon the state of K2) feeds the emitter signal directly to the base of Q4. As a result of this action, the low frequency phase components present at the emitter of Q3 predominate at the base of Q4 and are 180 degrees out of phase with the same signal at the collector of Q3. Conversely, capacitor C5 presents a very low impedance to the higher signal frequencies allowing them to pass readily to the base of Q4.

At intermediate frequencies, the vector sum of R13 (R13 and R14) causes the signal to be applied to the base of Q4 at some intermediate phase angle between zero and 180 degrees while the amplitude remains constant throughout the entire frequency range.

The result of this frequency/phase shift action cancels the inherent phase distortion on the signal caused by the magnetic transfer characteristics when the signal was recorded on the tape.

In fast tape speed operation, K2 is deenergized as shown. During slow tape speed operation K2 is energized which removes R14 from the circuit.

Emitter follower Q4 provides the required signal isolation and impedance output requirements. C6 couples the signal from the emitter to the gain control R17, and then out to the A-B switching relay through terminal 22. R16 and terminal 21 provide an outlet for signals bypassing the gain control. This output is provided for the extraction of any pilot signal mixed with the audio. Filtering of the pilot from the remaining signals must be accomplished externally of the signal electronics provided with the Series 400 equipment.

Q5 is a series voltage regulator which provides regulated power from the input bus terminal 12 to the four transistor stages in this assembly. R24 and R25 establishes the proper operating point for Q5, thus establishing a fixed voltage drop across Q5. C15 provides filtering of any power supply ripple on the regulated voltage. C9 filters any ripple at the base of Q5.

Maximum convenience is afforded if two separate 7/9 boards are used. One is inserted in slot 7 as a reproduce preamplifier and one in slot 9 as an overdub preamplifier. It is then only necessary to employ the record select switch to change from normal record to overdub operation. Economy but less convenience is obtained with a single overdub preamplifier, changing its location from slot 7 to slot 9 when changing the switch from normal record to overdub. Great care must be exercised to turn off the recorder completely before moving the 7/9 card from slot 9 to slot 7 since the playback head may be magnetized from a charge residual on C1 unless sufficient time is permitted for it to discharge completely.

Line Amplifier (6) (See Figure 34)

This is a full-spectrum flat response amplifier which provides sufficient gain and output power to adequately drive an outgoing line at up to peak level of +28 dbm (600 ohms) or to drive a loudspeaker with up to one watt peak excitation (distortion 1% THD).

Q1 is an emitter follower accepting an input impedance of 10,000 ohms or lower, and providing low impedance excitation for Q2. Q2 drives Q3 and Q4 (complementary symmetry types) to result in push-pull excitation of Q5 and Q6. A required static potential difference between the bases of Q3 and Q4 is established by the contact potential drop across CR1, CR2, and CR3.

CR4, R20, and C12; CR5, R19, and C11 are drift compensation networks to stabilize the operating points of Q5 and Q6. DC operating point for these two transistors is set by R13, R14, and R15; and Q2, Q3, and Q4. A feedback path through C13, R21, and R22 assures minimum distortion for all signal frequencies. C15 and R23 provide a stabilization network to reduce the possibility of high frequency oscillations (parasitics) when certain types of loudspeakers are connected through S1 to terminal 20, and ground. In the alternate switch position the amplifier feeds out on either terminal 21 or 22 to the matching output transformer mounted in the main module, whose purpose is to match the amplifier to a 150 or 600 ohm line. R24 provides a small impedance in series with certain type transformers which would otherwise approach a short circuit at extremely low frequencies and thereby upset the stability of the amplifier at frequencies in the order of one cycle or less.

R1 and R3 are fixed resistors which may be readily changed to alternate values to change the working line level as indicated by the VU meter. The amplifier is normally equipped with the proper values for reading a plus four dbm 600 ohm line. To operate from a +6, +8, or +14 dbm, 600 ohm line, select $\pm 5\%$ calibrating resistors according to the following table 9.

Table 9. Line Operating Level Calibrating Resistors

LINE OPERATING LEVEL - 600 OHMS	VALUE OF CALIBRATING RESISTORS	
	R1	R3
dBm		
+4	3.9K	7.5K
+6	4.7K	6.2K
+8	6.2K	4.3K
+14*	7.5K	3.3K
* Operated in 150 ohm position with R109 on switch S106 removed.		

CR6, CR7, CR8, and S2 are associated with the automatic A-B transfer switching system. CR6 and CR7 are isolating diodes permitting all modules to be operated from pulses originating in the transport, but preventing the transfer buttons on any single module from simultaneously activating the transfer circuits of other modules. CR8 is an inductive suppression diode effectively across the coil of the A-B transfer relay.

Power Supply Assembly (5) (See Figure 33)

This unit contains the power transformer for 2 track recorders, a large filter capacitor, and a regulator circuit to assure that the output of +28 volts is maintained within a few millivolts under varying load conditions.

Line voltage is applied to terminals 5 and 20 for 2 track recorders, through the 1.5 ampere fuse F1 to the power transformer. The transformer secondary feeds a bridge rectifier CR1, CR2, CR3, and CR4 charging C1 through surge limiting resistor R1. In 4 track recorders, +28 volts ac is applied to terminals 7 and 3 through a 2 ampere fuse to the bridge rectifier. Q1 is the power regulator transistor. R2 has a very low resistance and is used to monitor the load current. Its action will be described below. The regulated dc output is taken from terminal 12, positive, and terminal 9, negative and ground. R7 and R8 are in series across the output terminals. Any variation in output voltage is therefore monitored by the base of Q3 which amplifies the base voltage variation because the emitter is kept at constant potential by zener diode CR6. The amplified variation is applied to the base of Q2 where it is further amplified and applied to the base of Q1, thus compensating for the initial variation.

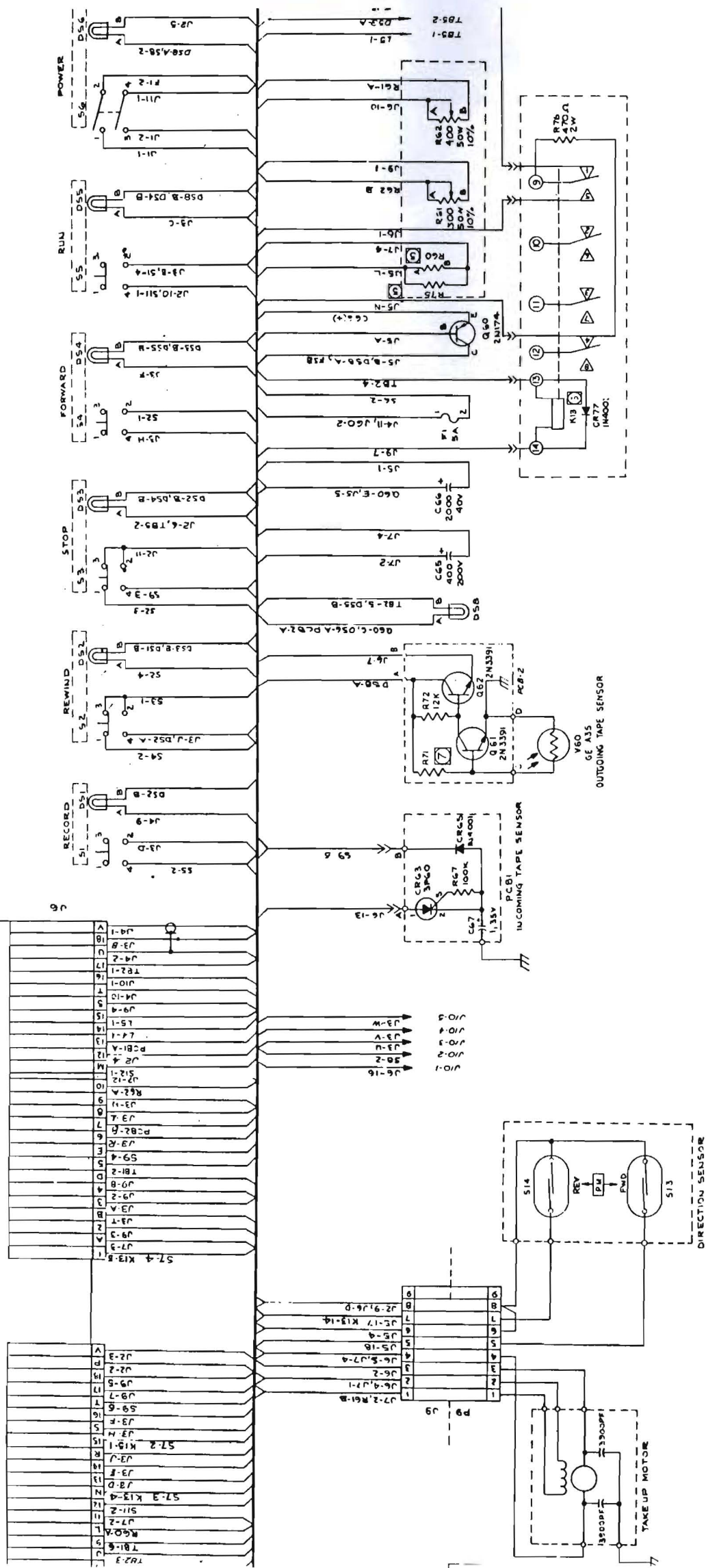
If the power supply is loaded too heavily, so as to possibly damage Q1, the voltage drop across R2 causes a potential difference to occur across the base and emitter of Q4. However, this is only after the drop across R2 is sufficient to exceed the contact potential of CR5, and CR5 becomes conductive. Thus, this circuit is inactive until a definite load is exceeded. When Q4 becomes conductive, it takes control of the regulator circuit and causes the output voltage to drop with increasing load, thus protecting the control transistor Q1.

Resistors R11, R12, and R13 are part of the A-B transfer circuit, other components of which are wired into the main assembly.

NAB Erase Coupler (3N) (See Figure 31)

This is a very simple board which connects the erase power amplifier on board 1 to the erase head and permits monitoring erase current. 120 kHz power from the erase amplifier is supplied to terminal 20. C1 forms a resonant circuit with the erase head to provide maximum head current. L1 and C2 form a resonant circuit at 240 kHz to shunt the second harmonic of the erase waveform around the erase head. Terminal 17 is connected to the head return which is isolated from ground by 10 ohms in the erase amplifier chassis. This point and the test point connected to it becomes a monitoring point for 120 kHz current. R3 permits erase meter calibration.

LOGIC BOARD



99/100
2013

NOTES, UNLESS OTHERWISE SPECIFIED:

1. ALL CAPACITANCE VALUES ARE IN MICROFARADS
2. ALL RESISTANCE VALUES ARE IN OHMS
3. WHEN INSTALLING HARNESS IN M64, MAKE CHANGE AS FOLLOWS FOR PROPER ROTATION OF REEL MOTORS & DIRECTION SENSING:
 - J111 BECOMES J7-1
 - J7-1 BECOMES J111
 - J9-1 BECOMES J11-1
 - J11-1 BECOMES J9-1
 - J9-2 BECOMES J11-2
 - J11-2 BECOMES J9-2
 - J9-3 BECOMES J11-3
 - J11-3 BECOMES J9-3

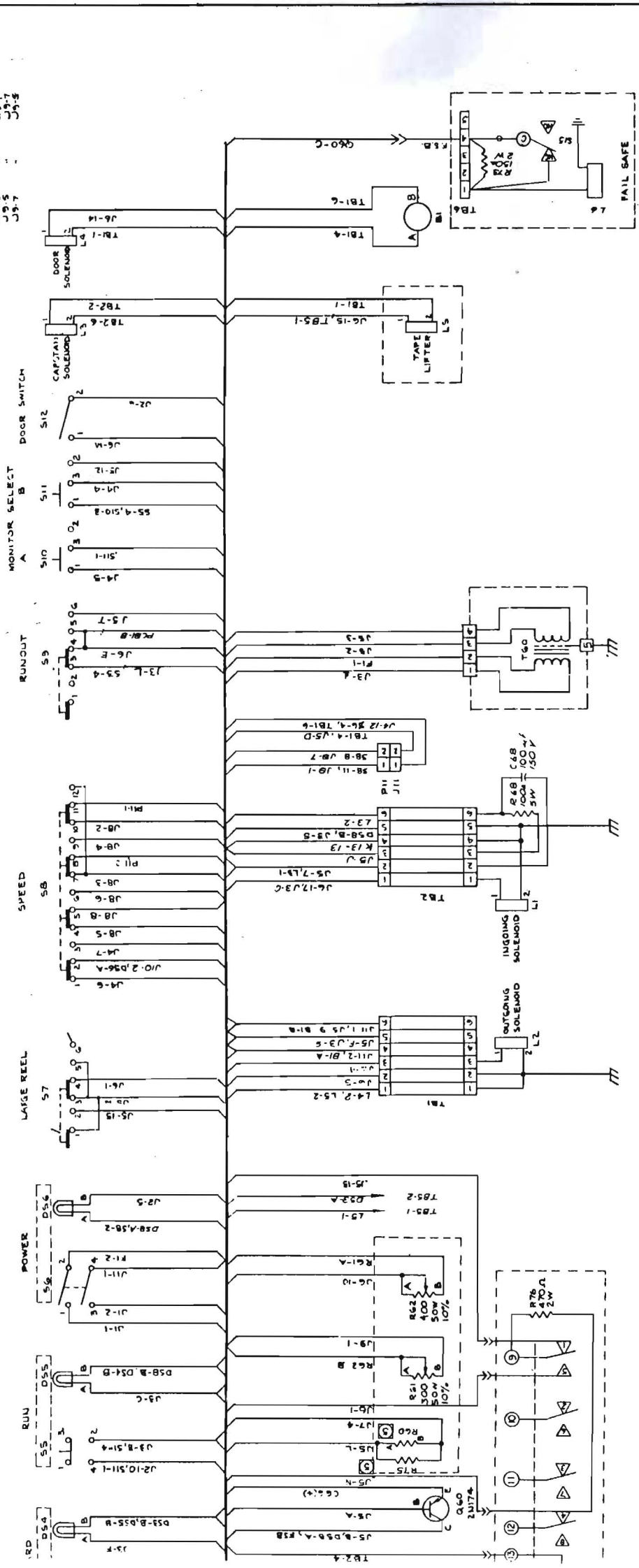
4. FOR ALL 1/4 IN MACHINES

- A. REPLACE R40 BY (000.25W)
- B. INSTALL X13 IN PARALLEL
- C. DETACH ALL WIRE FROM J7
- D. DETACH (M64) AND R78 (M64W)

COILS	R10	R75	R13
1/4 IN	1000	200	YES
1/2 IN	150	NONE	NO
3/4 IN	150	NONE	NO
FILM SYNC	150	NONE	NO
ISO MIL	250	500	NO

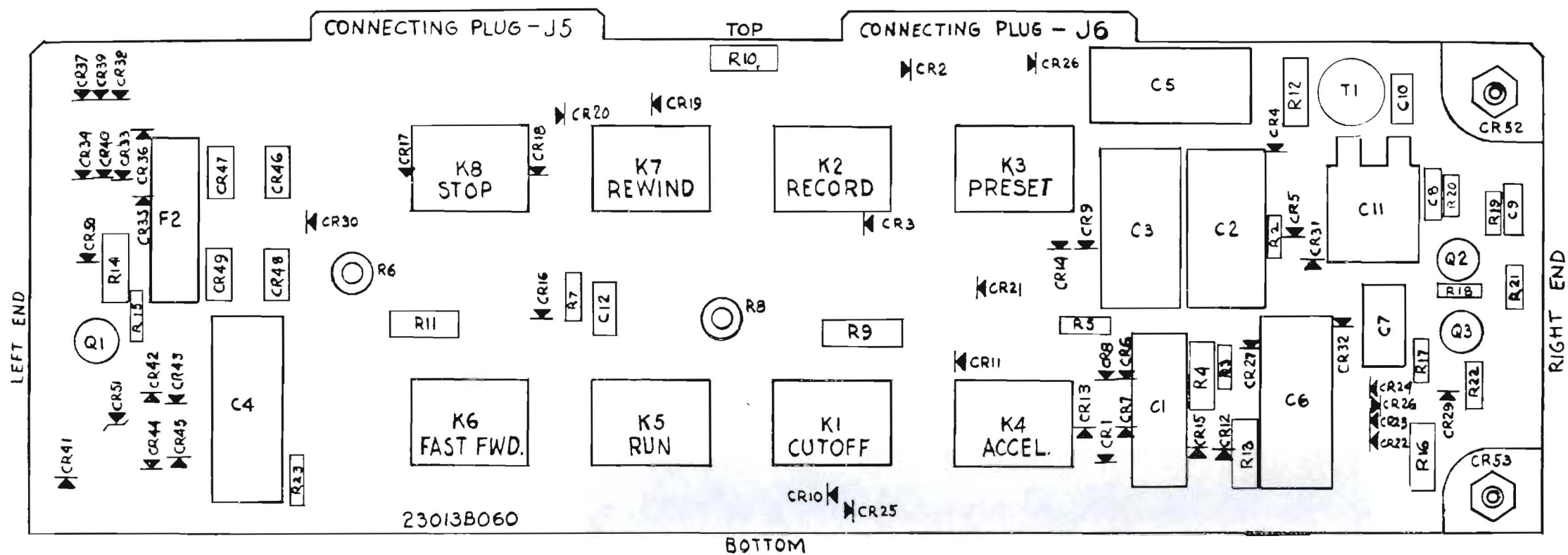
6. ALL ITEMS ENCLOSED WITHIN DASHED LINES WILL BE ADDED AS REQ'D WHEN THIS SUB-ASSY IS MATED WITH ASSOCIATED ASSEMBLY.

7. VALUE TO BE SELECTED DURING MACHINE TESTING



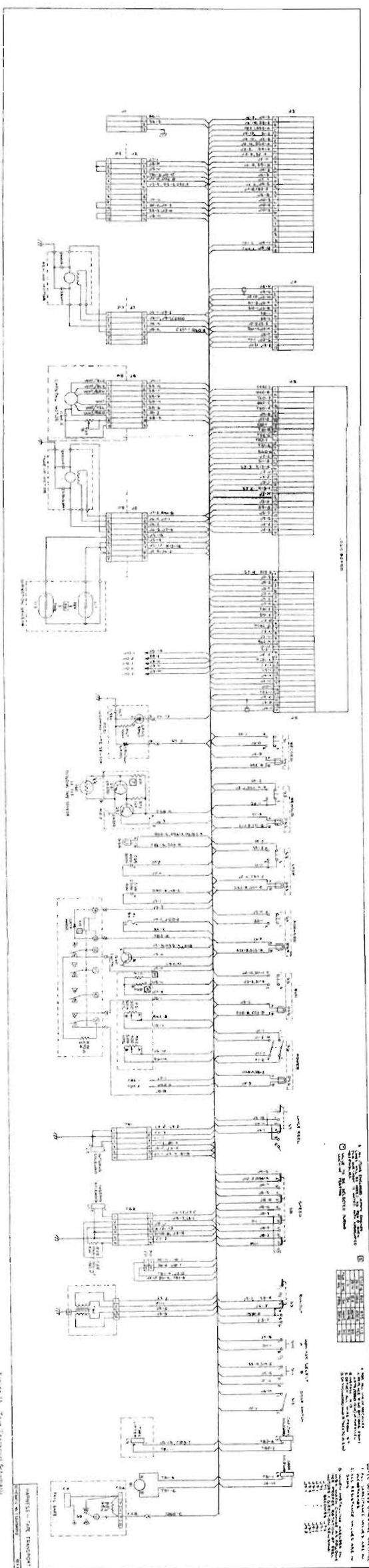
HARNESS — TAPE TRANSPORT
SCHEMATIC NO. L22018000
REV. 14

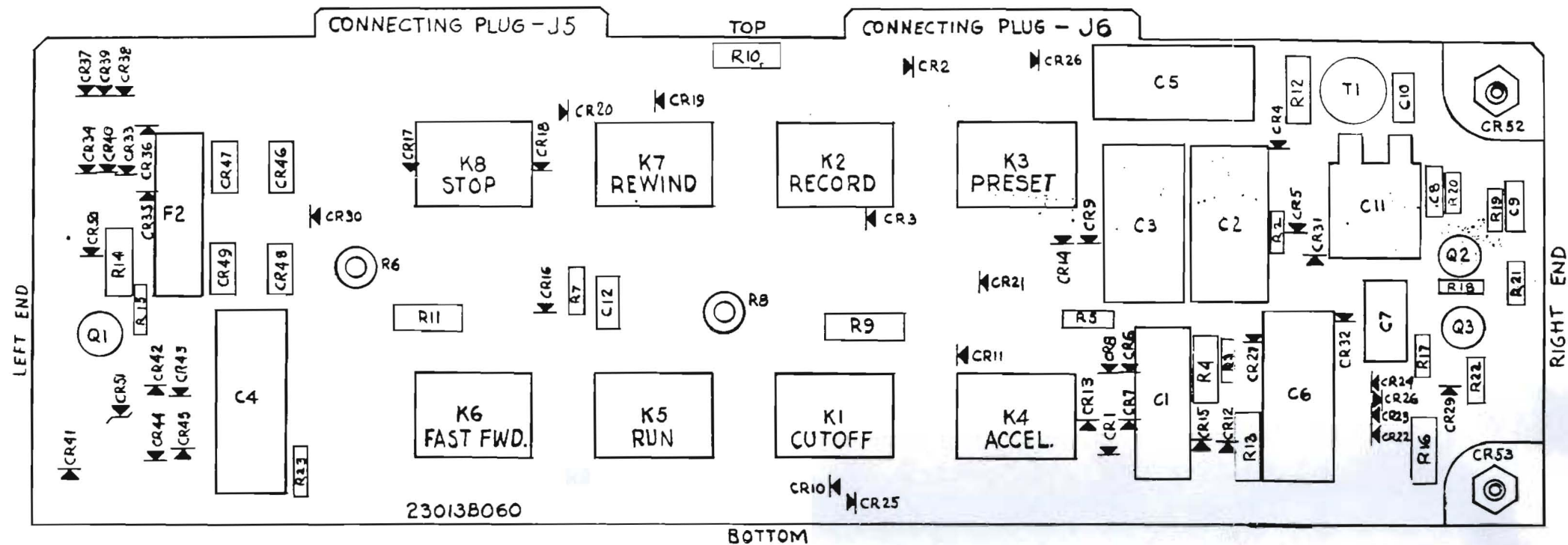
Figure 25. Tape Transport Schematic
M64 PAR 2-71
99/100
30F3



LAYOUT OF COMPONENTS ON LOGIC BOARD 23013B060
VIEWED FROM COMPONENT SIDE

Figure 26. Tape Transport Circuit Board Layout

[illegible]



LAYOUT OF COMPONENTS ON LOGIC BOARD 23013B060
VIEWED FROM COMPONENT SIDE

Figure 26. Tape Transport Circuit Board Layout

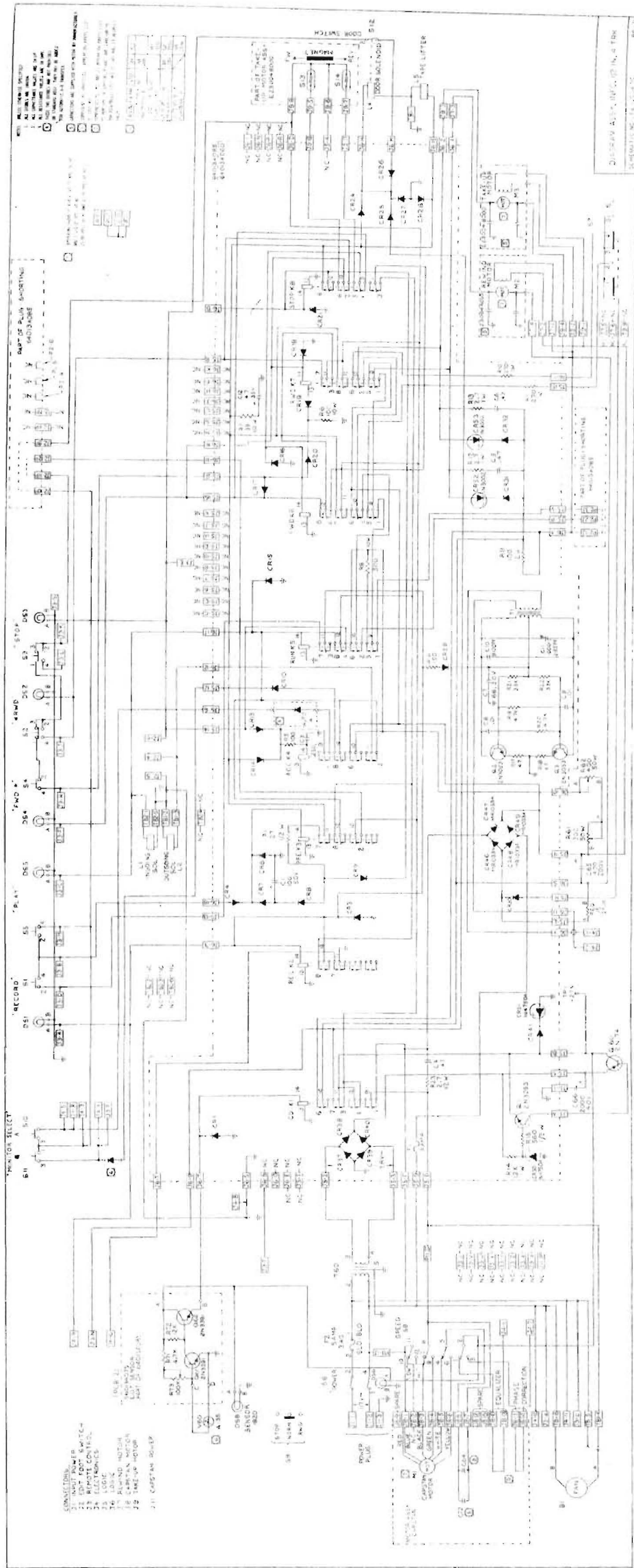


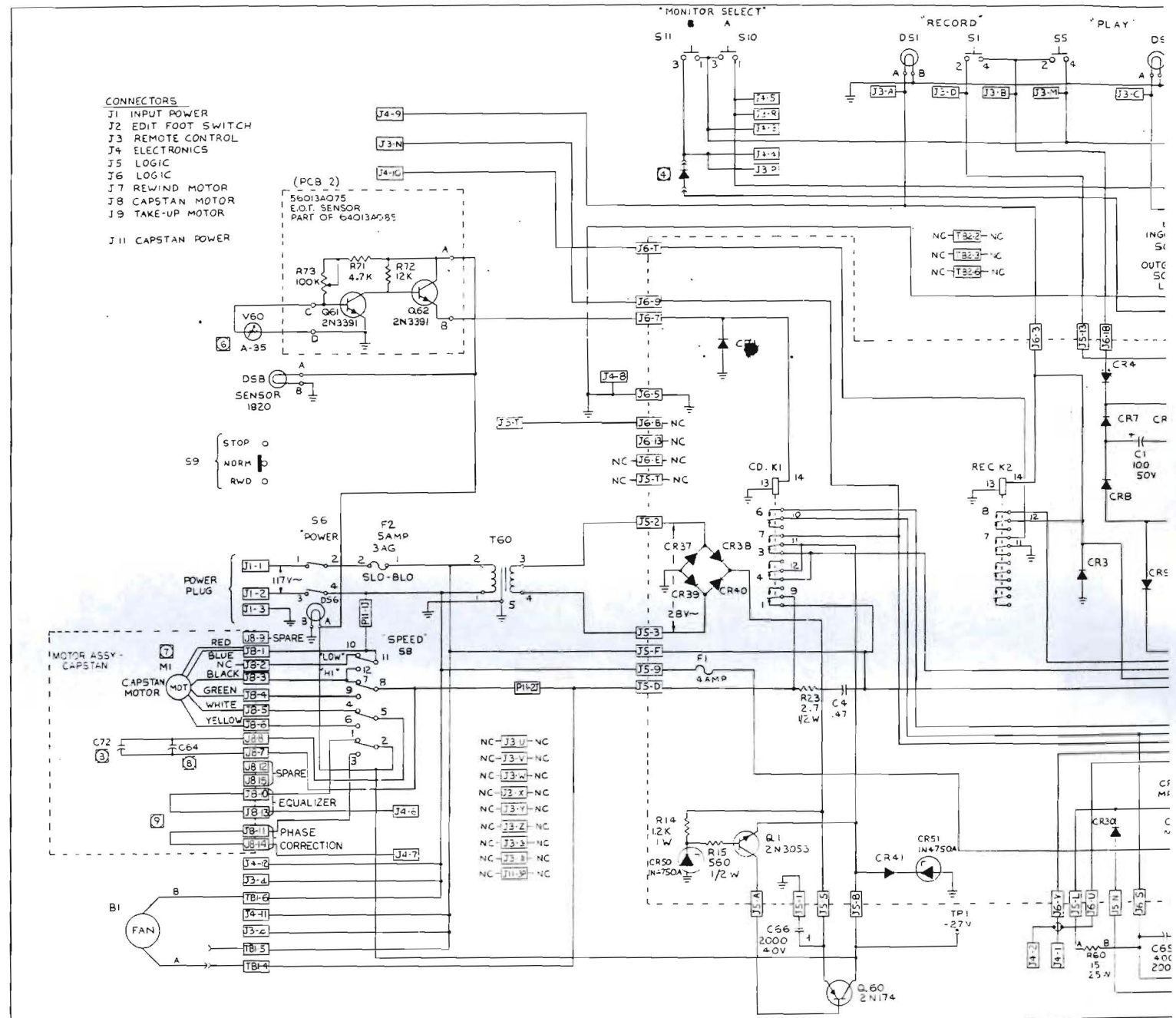
Figure 27. Tape Transport Wiring Diagram

M64 PAR 3-72

CONNECTORS

J1 INPUT POWER
J2 EDIT FOOT SWITCH
J3 REMOTE CONTROL
J4 ELECTRONICS
J5 LOGIC
J6 LOGIC
J7 REWIND MOTOR
J8 CAPSTAN MOTOR
J9 TAKE-UP MOTOR

J11 CAPSTAN POWER



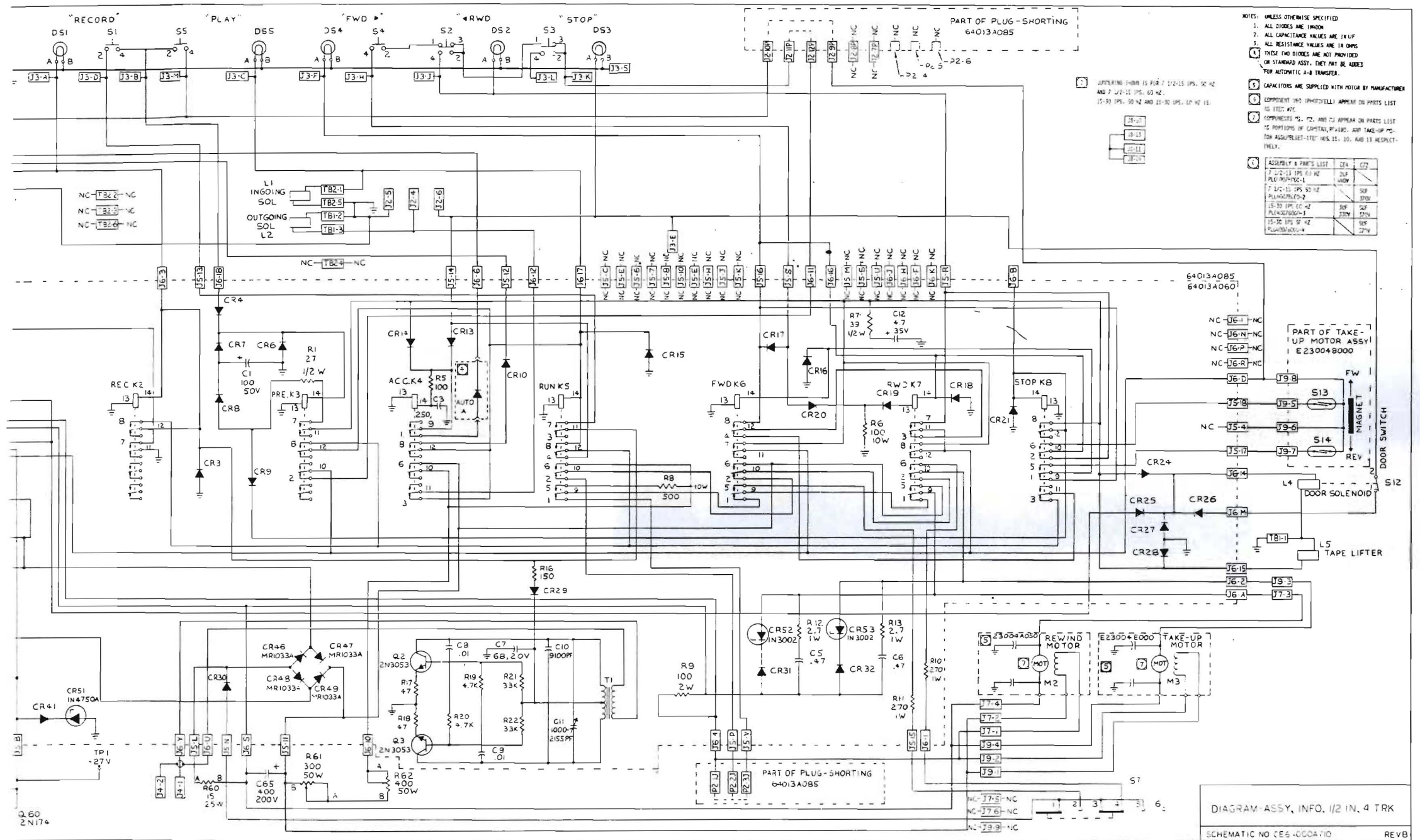
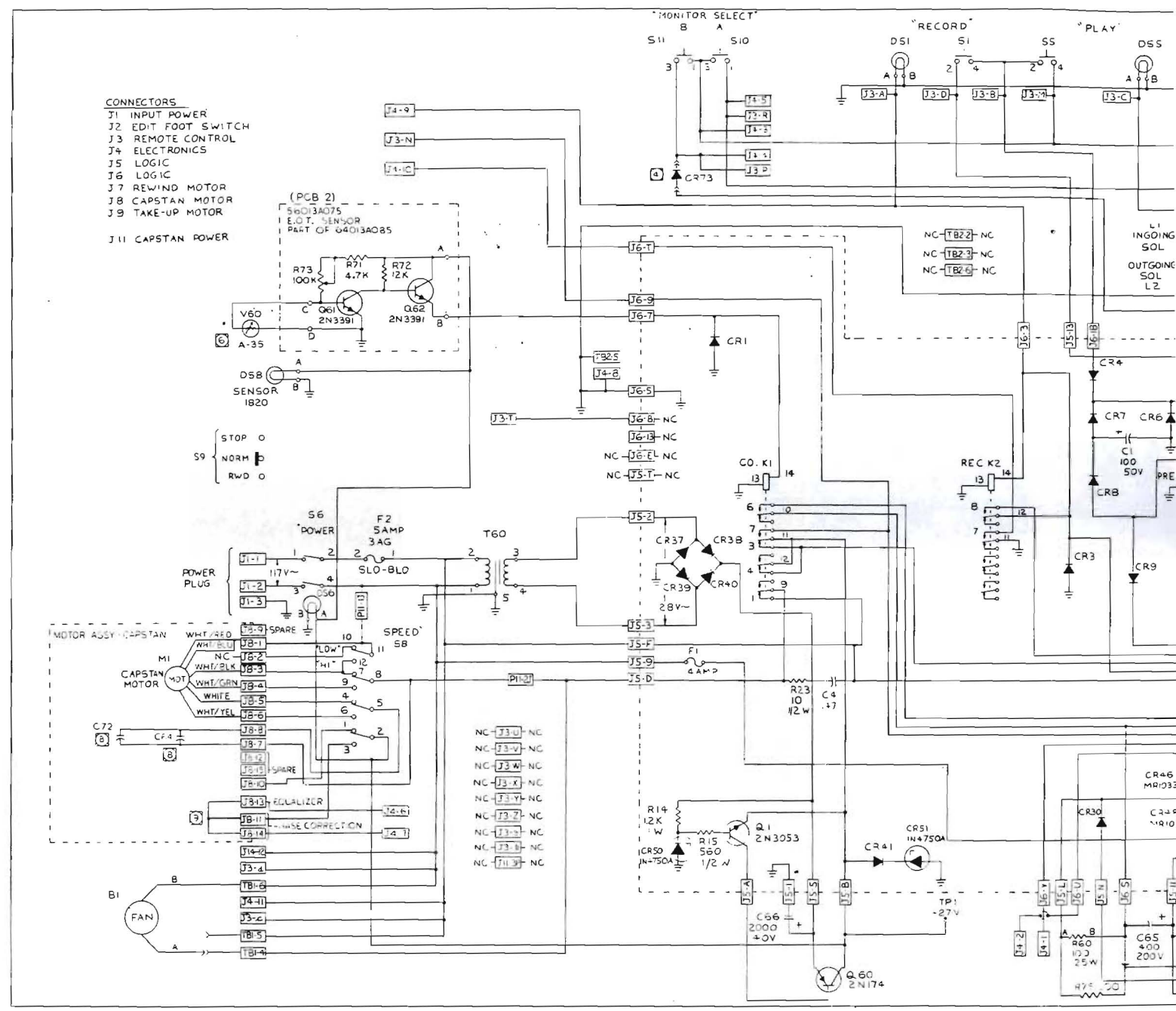
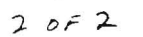


Figure 27. Tape Transport Wiring Diagram

- CONNECTORS
- J1 INPUT POWER
 - J2 EDIT FOOT SWITCH
 - J3 REMOTE CONTROL
 - J4 ELECTRONICS
 - J5 LOGIC
 - J6 LOGIC
 - J7 REWIND MOTOR
 - J8 CAPSTAN MOTOR
 - J9 TAKE-UP MOTOR
 - J11 CAPSTAN POWER





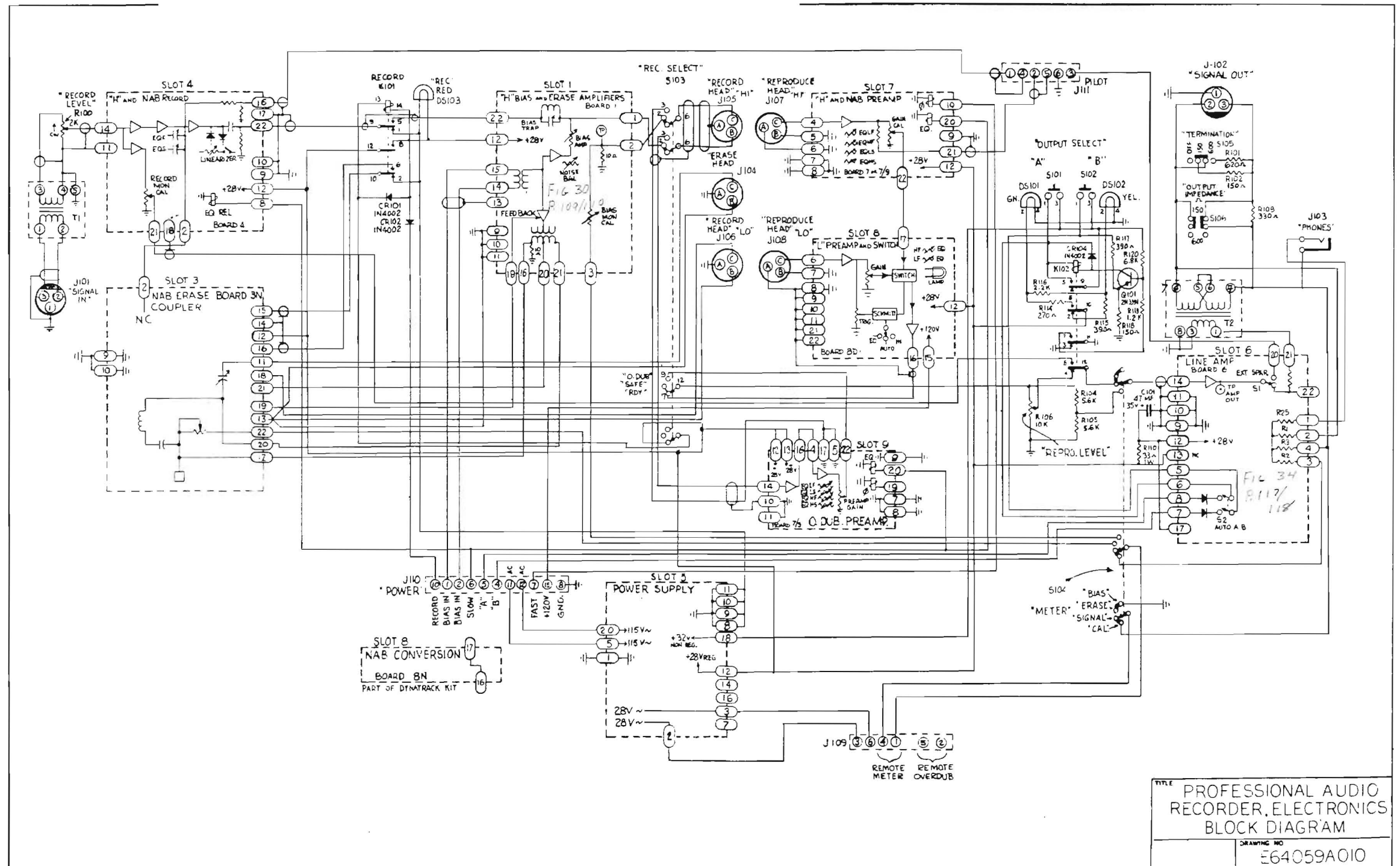


Figure 28. Electronics Block Diagram

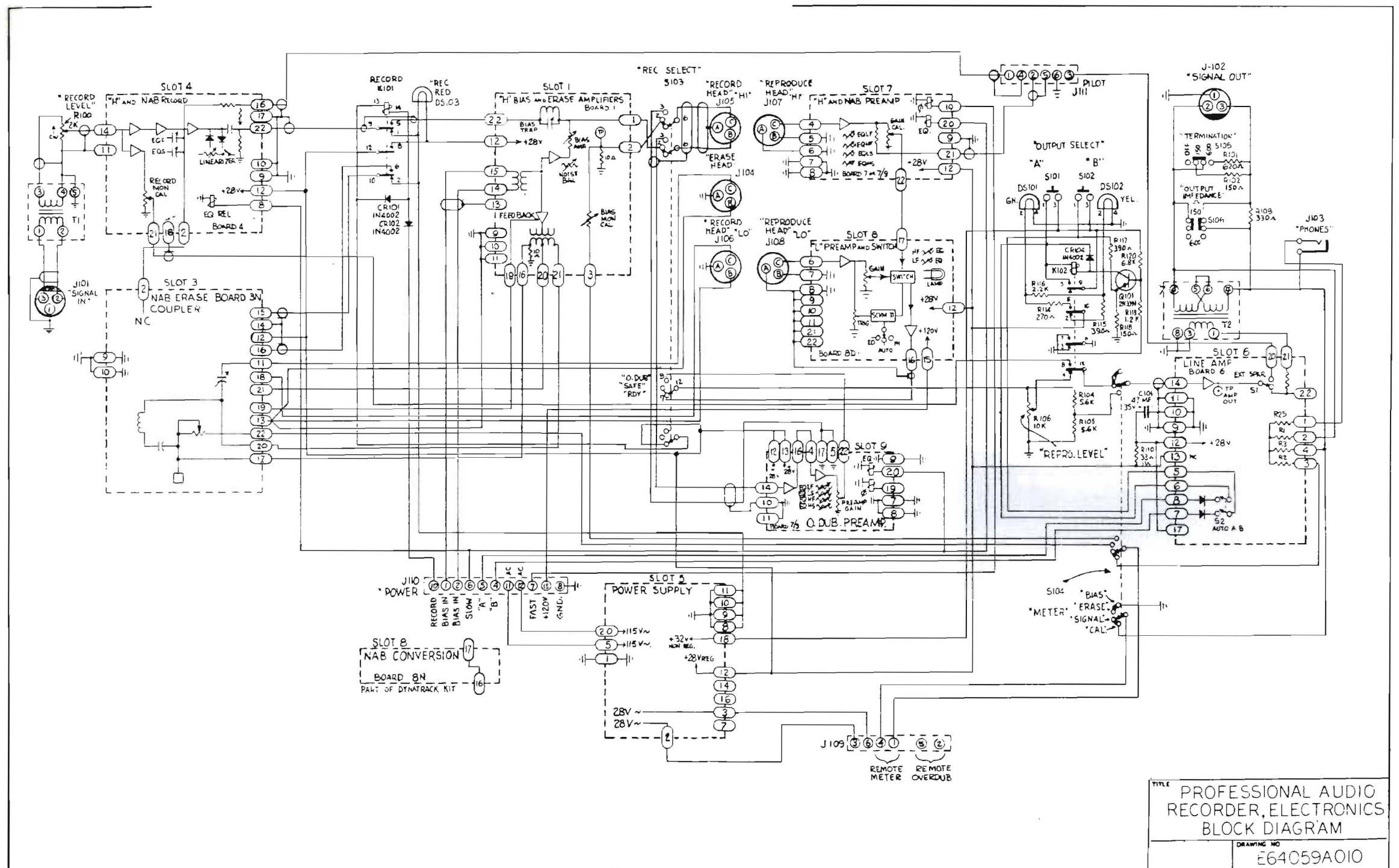
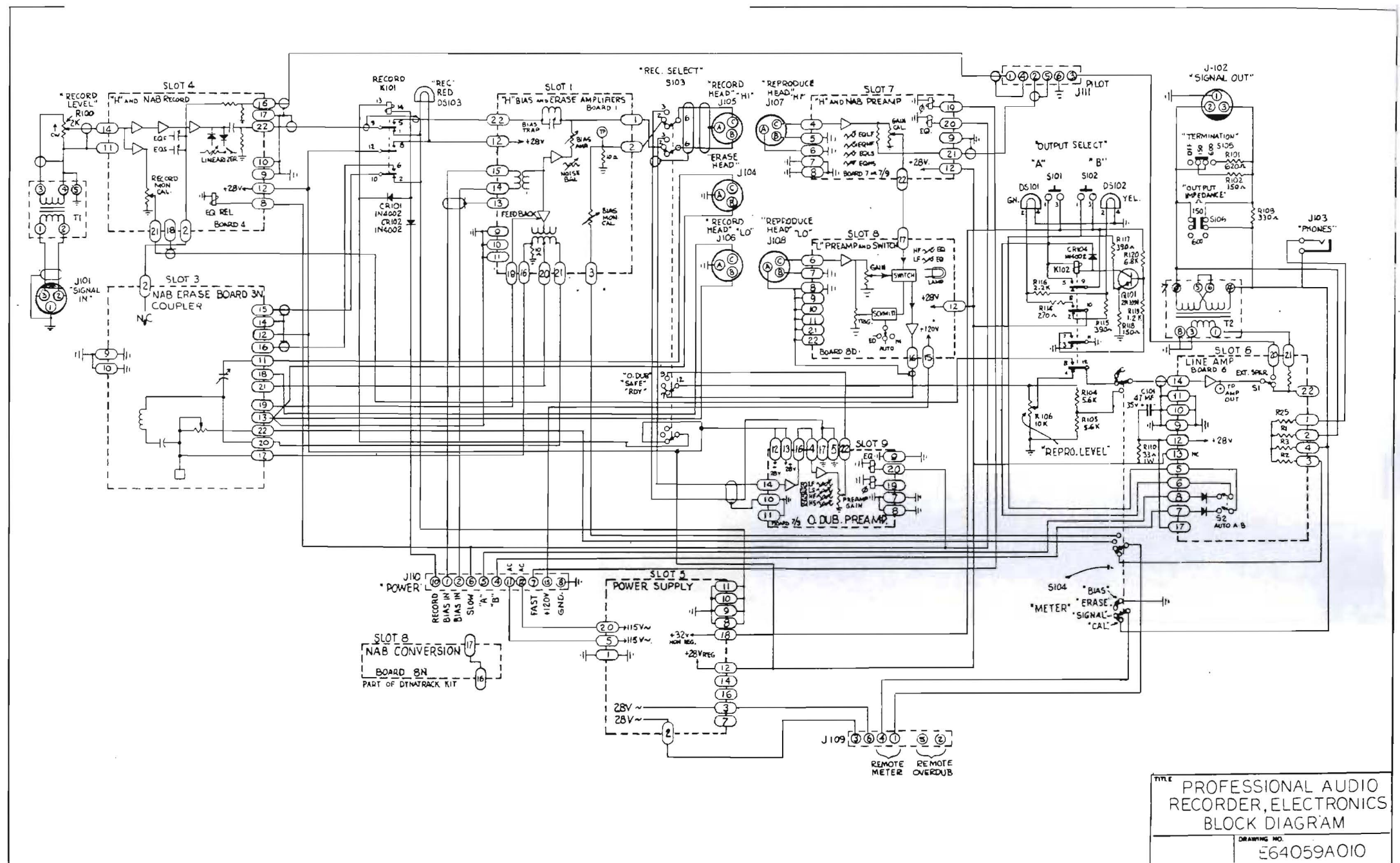
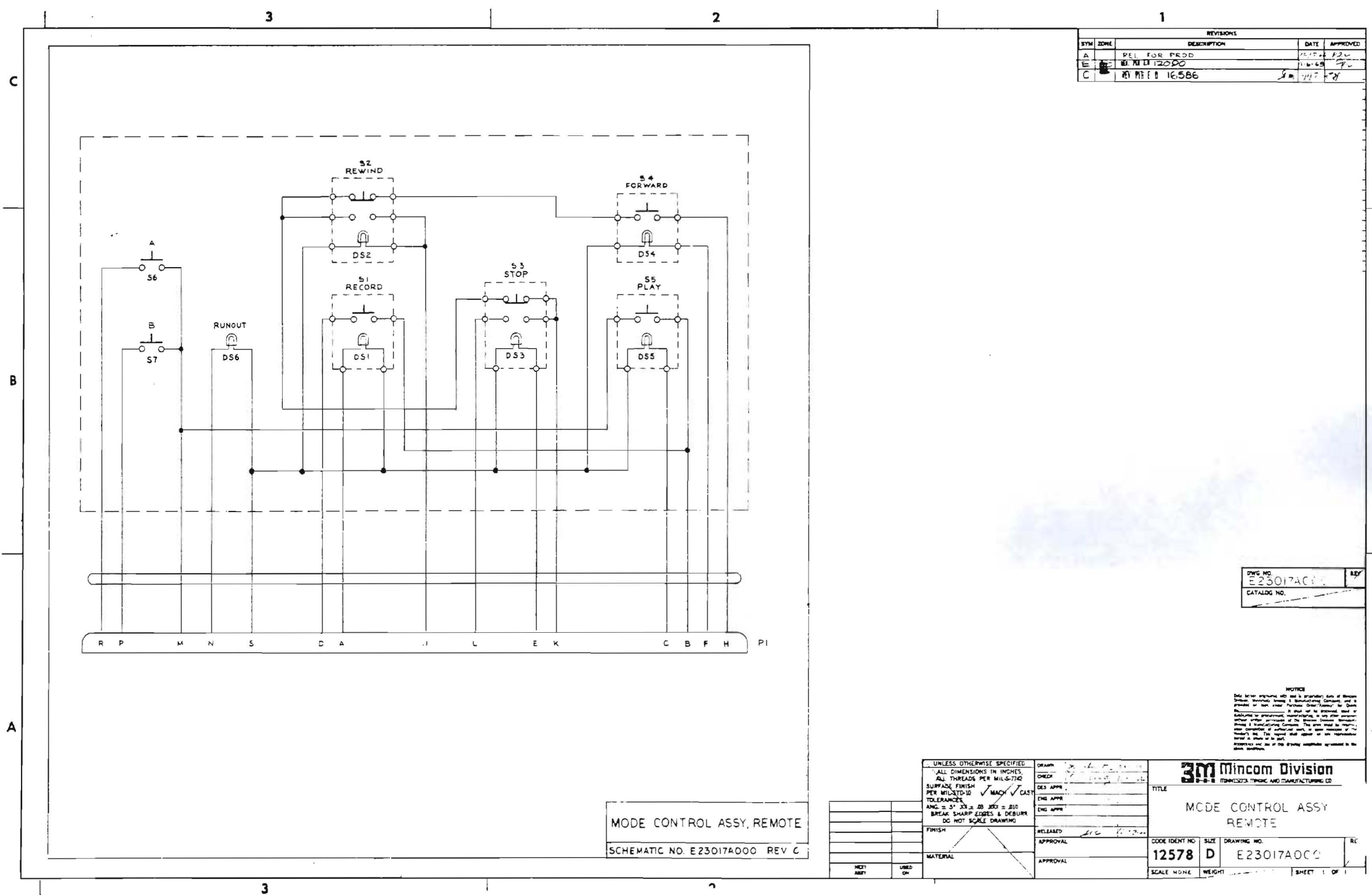


Figure 28. Electronics Block Diagram





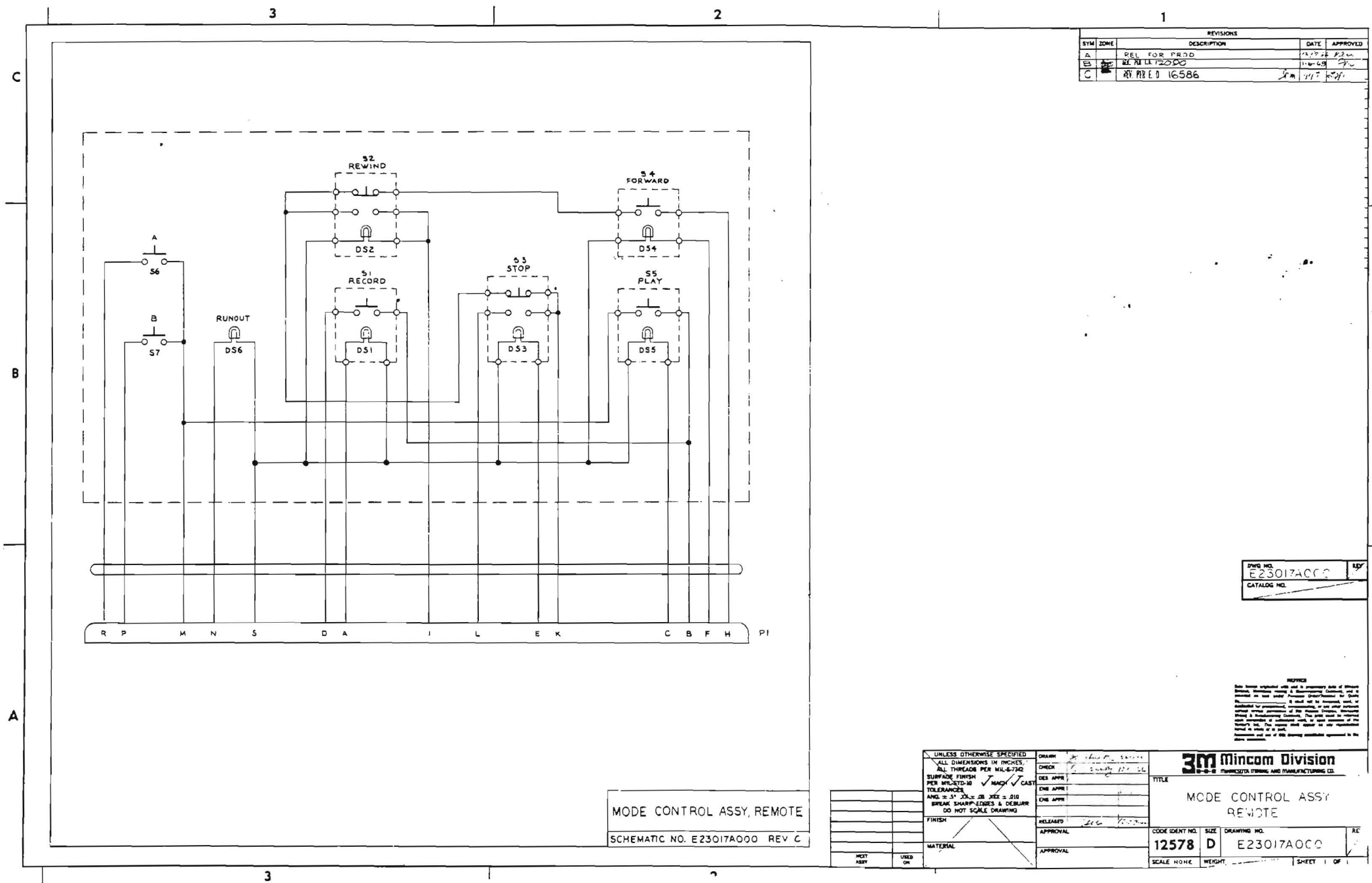


Figure 29. Remote Control Assembly Schematic

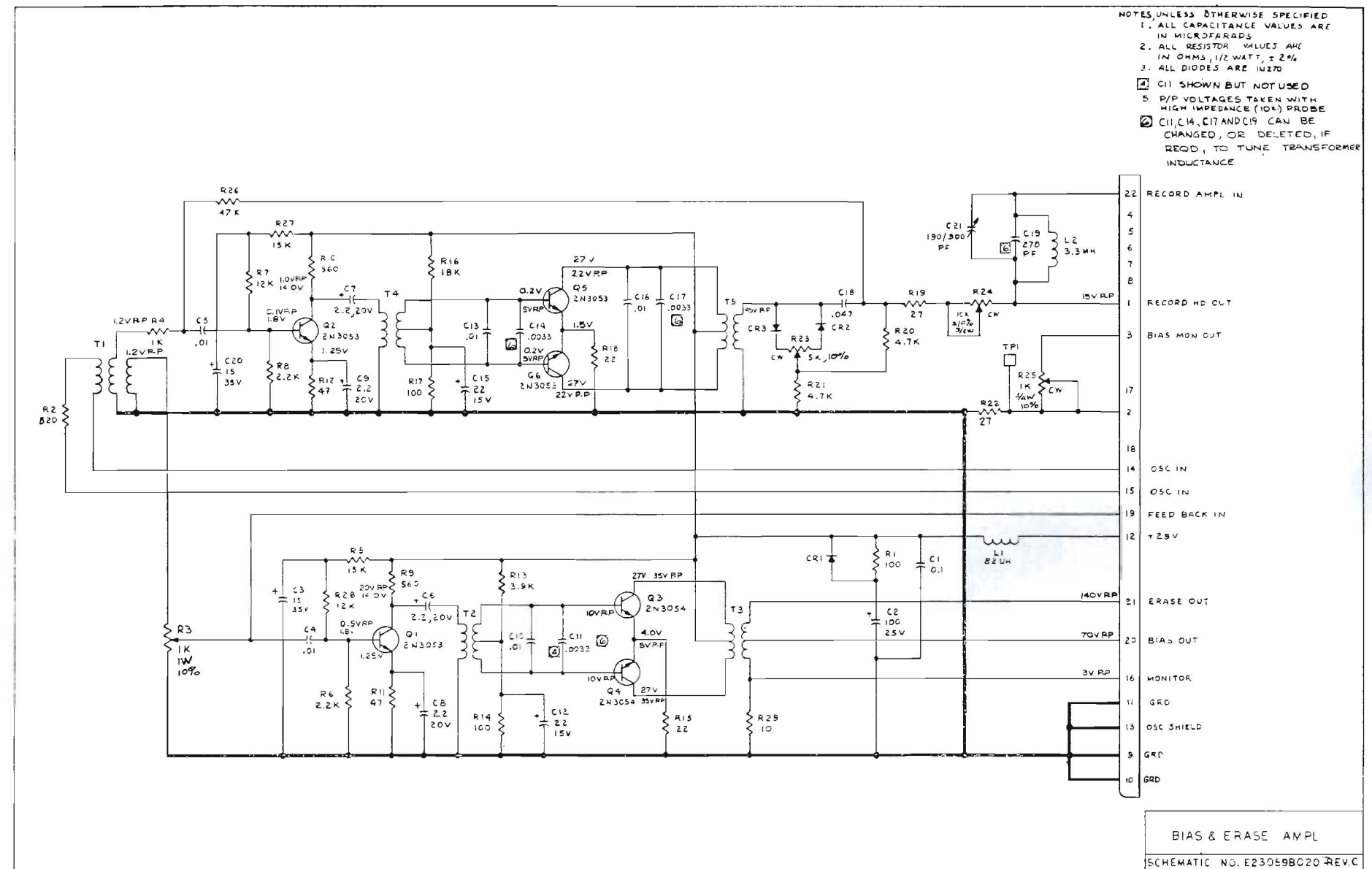


Figure 30. Bias and Erase Amplifier Schematic

BOTTOM
VIEW
2N3054



2N3053

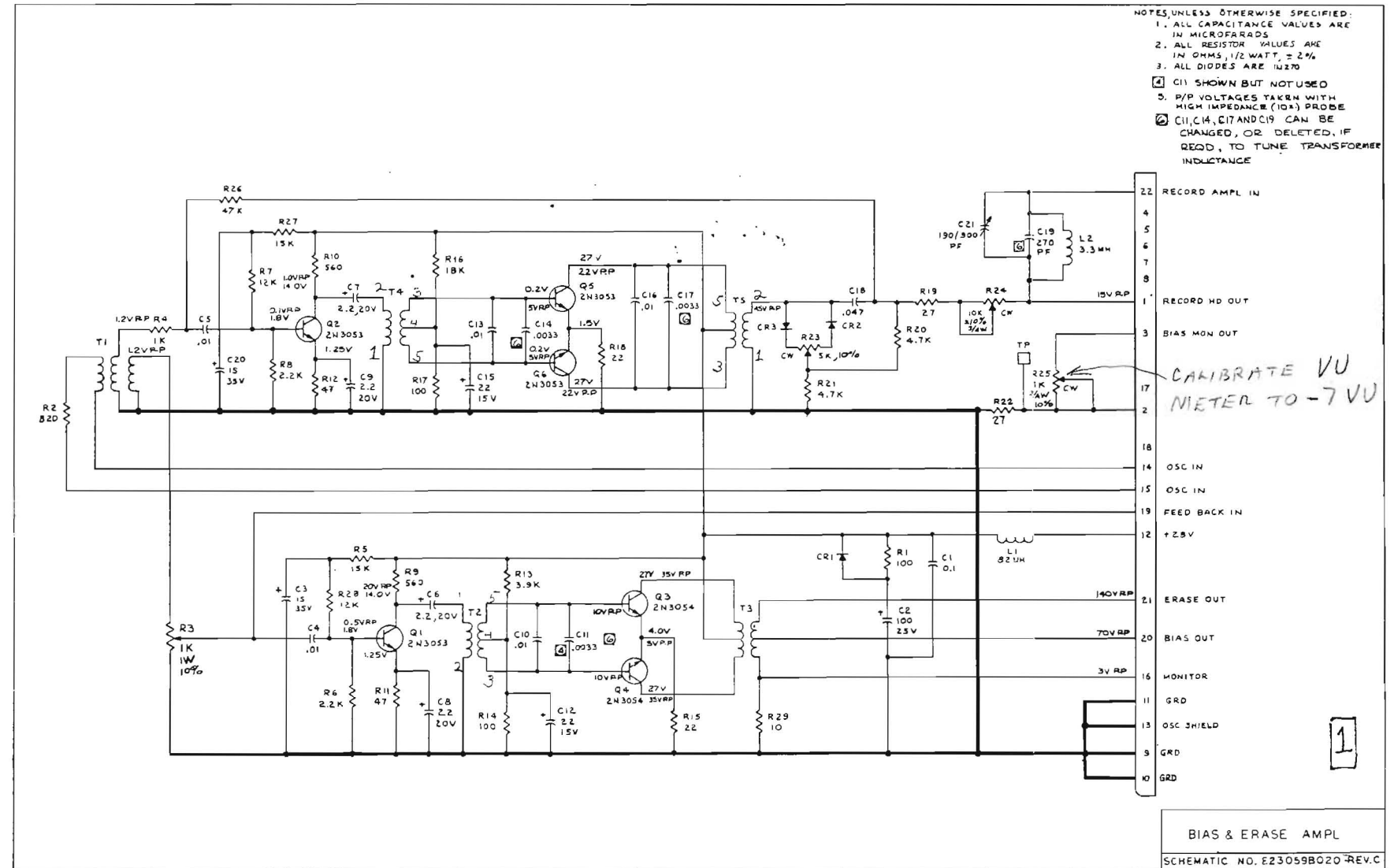
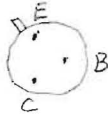


Figure 30. Bias and Erase Amplifier Schematic

N
 3

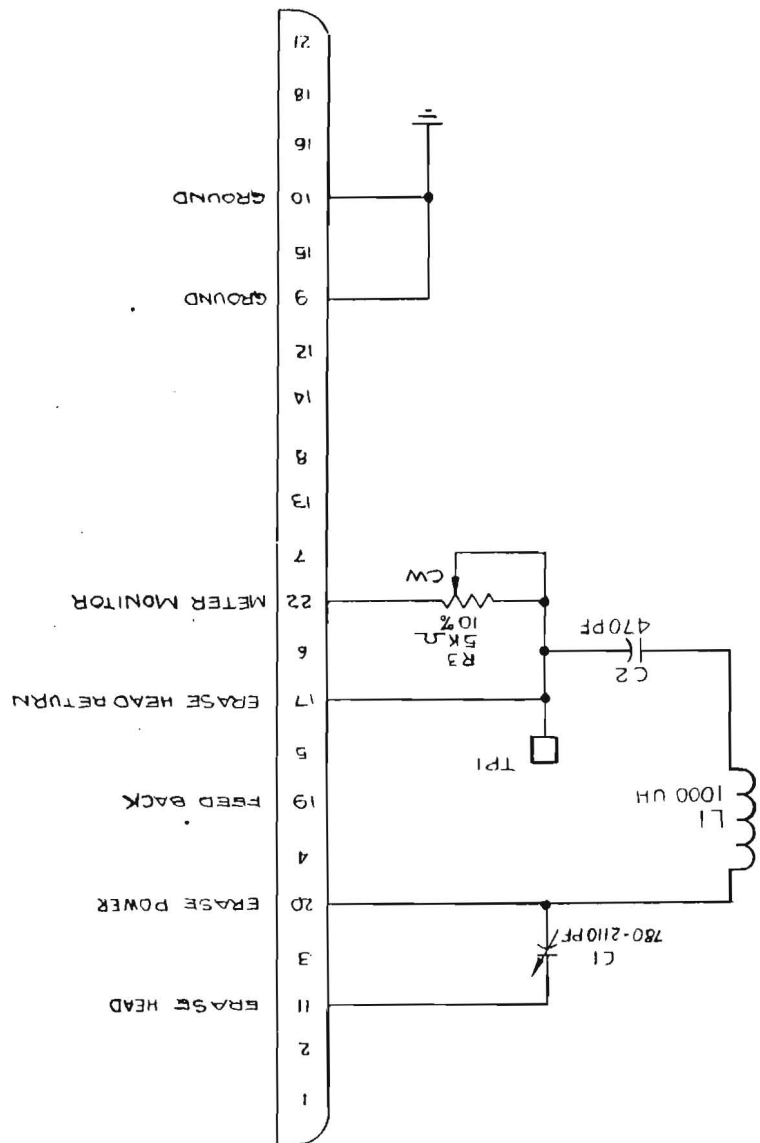
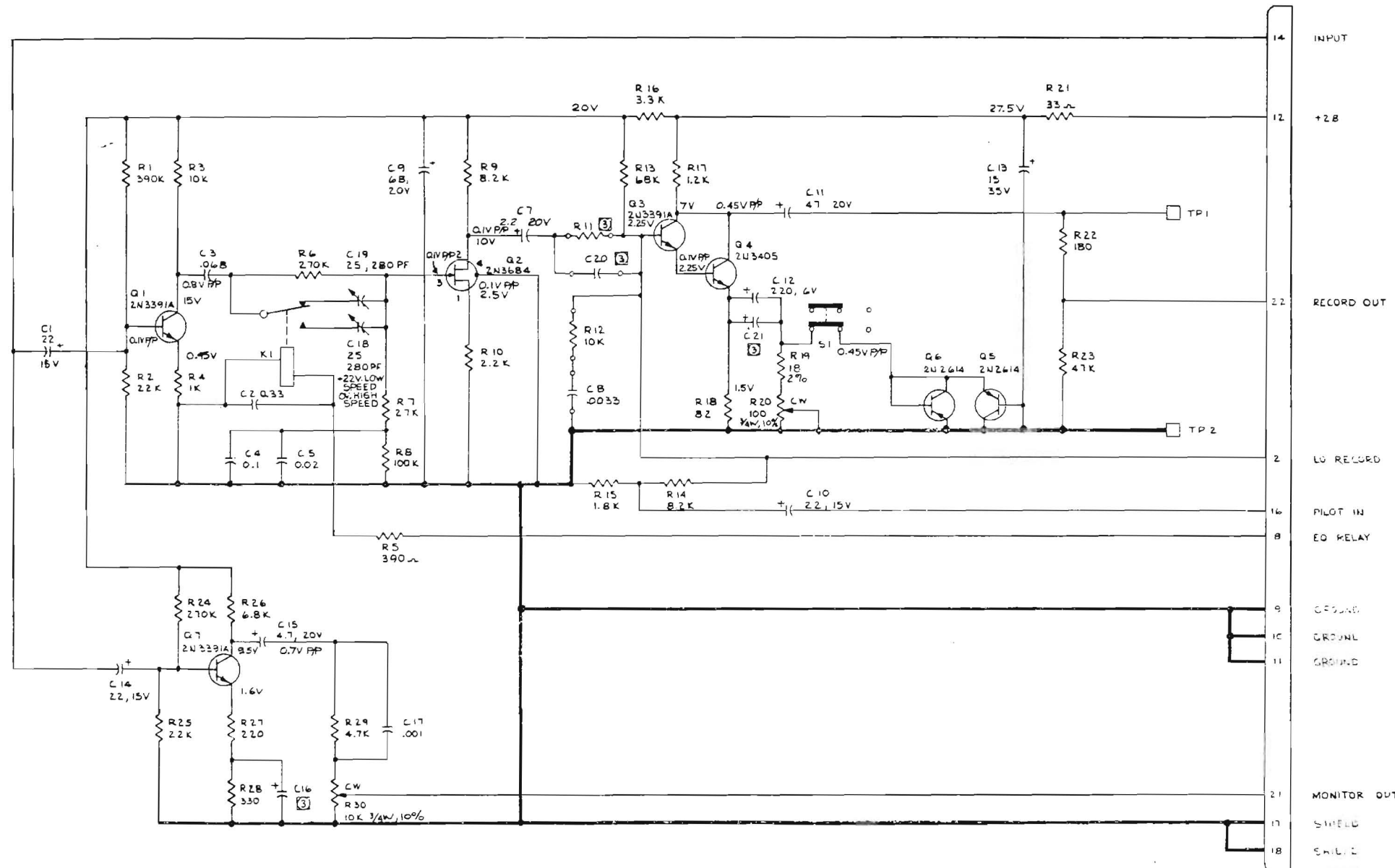


Figure 31. NAB Erase Coupler Schematic

- NOTES: UNLESS OTHERWISE SPECIFIED
 1. CAPACITANCE VALUES ARE IN MICROFARADS
 2. RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, $\pm 2\%$
 3. C16, C20, C21 & R11 ARE NOT FURNISHED. R11 IS JUMPED OUT.
 4. P/P VOLTS AT 0VU 1KC



4

NAB RECORD AMPLIFIER

REMAINING RECORDS

Figure 32. NAB Record Amplifier Schematic
 M64 PAR 3-72



113/114

4 R7 & R8 VALUES MAY BE CHANGED IF REQD, TO ADJUST OUTPUT VOLTAGE TO $28.25 \text{ VDC} \pm .25 \text{ VDC}$

REV
[]

M64 PAR 3-72

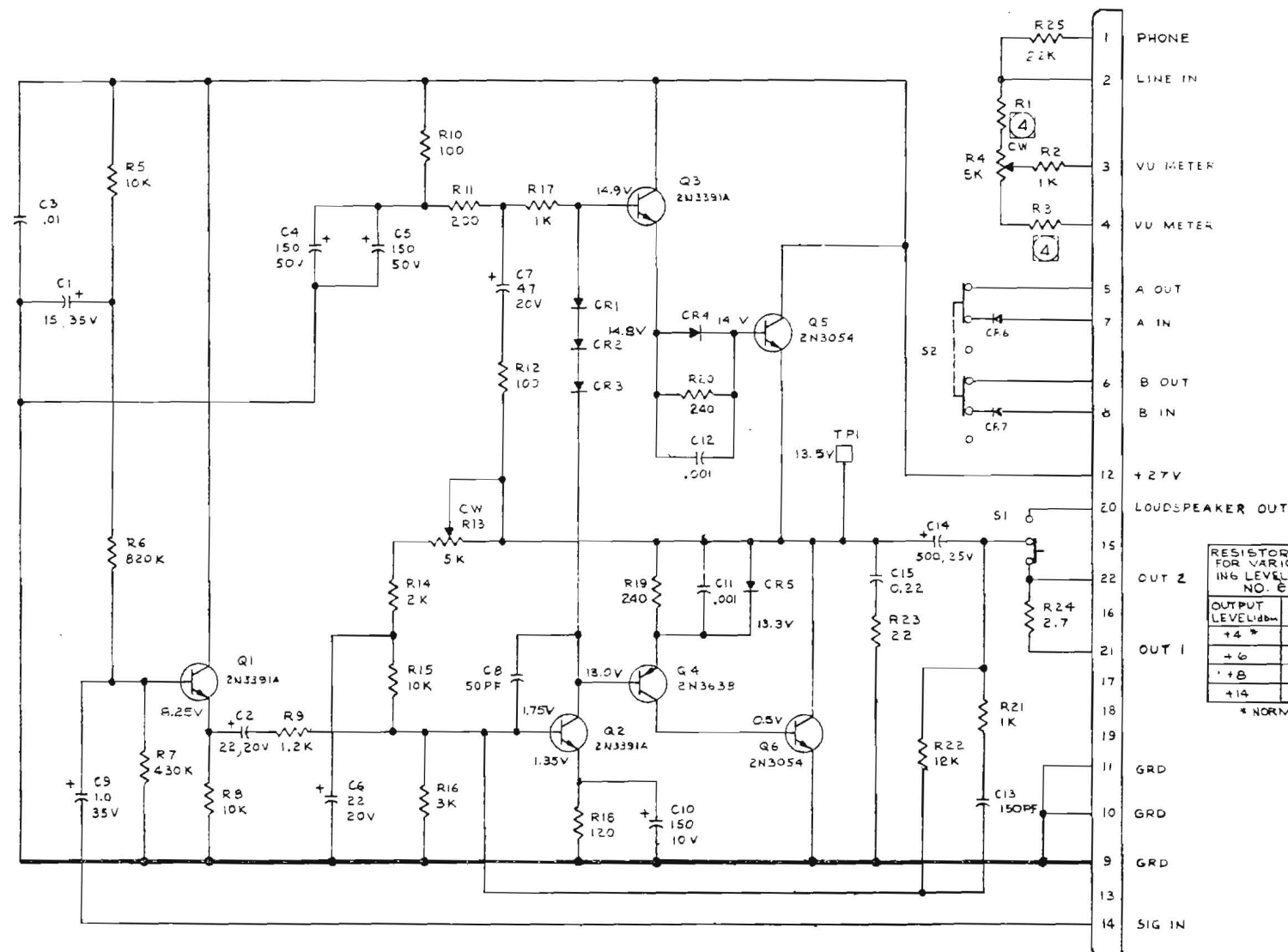
4 R7 & R8 VALUES MAY BE CHANGED
IF REQD, TO ADJUST OUTPUT VOLTAGE
TO 28.25 VDC \pm .25 VDC



SCHEMATIC NO. E64031A000	REV C
--------------------------	----------

M64 PAR 3-72

- NOTES: UNLESS OTHERWISE SPECIFIED
 1. CAPACITANCE VALUES ARE IN MICROFARADS
 2. RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, $\pm 5\%$
 3. ALL DIODES ARE 1N4002
 4. VALUES TO BE SELECTED ON TEST PER TABULATION
 BLOCK AND DWG 000004884.



LINE DRIVER AMPLIFIER

SCHEMATIC NO. E23059A060 REV N

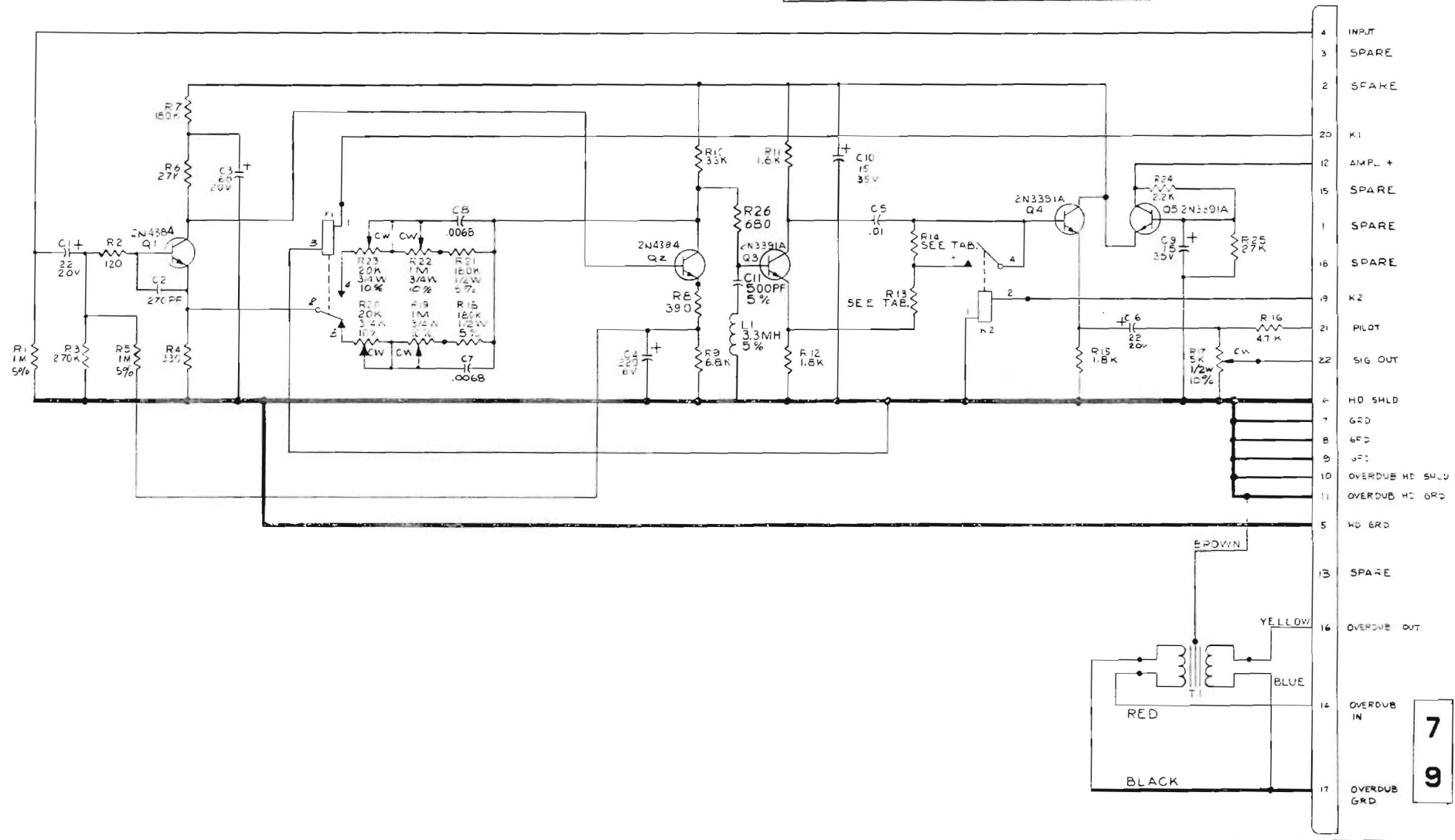
Figure 34. Line Driver Amplifier Schematic
 M64 PAR 3-72



117/118

NOTES: UNLESS OTHERWISE SPECIFIED
 1. ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, 2%
 2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.

COMPONENT VALUE TABULATION			
DASH NO.	CAT. NO.	CONFIG	VALUE
-1	83-4930-2180	7.5-151FS	R13 R14
-2	83-4930-2511	15-30 IPS	R10 R10L



PREAMP, OVERDUB
 SCHEMATIC NO. E23059B090 REV H

Figure 35. NAB Preamplifier with Overdub Schematic

PARTS LISTS

INTRODUCTION

This section contains parts lists for the 3M Brand Professional Audio Recorder. Drawings for mechanical assemblies are included to aid in parts identification. Electrical parts are identified by reference designators on the assemblies of which they are a part.

The parts list are arranged in alphanumerical order according to their part number which is in the upper right corner. When an assembly drawing is included, it follows immediately after the parts list. The top assembly drawing number is different for each recorder. Refer to table 10 for the appropriate top assembly number.

ORDERING REPLACEMENT PARTS

Parts should be ordered through one of the Mincom Division service offices listed below. 3M recommends that whenever possible, and particularly when an instrument is used in a critical application, the user maintains a minimum stock of spare parts. The Mincom Division has specialized personnel ready to assist the user in making a selection of spares. Any additional information required can be obtained by contacting the service offices listed below.

Western U. S. 3M Company
Mincom Division
300 South Lewis Road
Camarillo, California 93010
(805) 482-1911

Eastern U. S. 3M Company
Mincom Division
4701 Lydell Avenue
Cheverly Industrial Center
Cheverly, Maryland 20781
(301) 773-5050

When ordering parts the following information should always be supplied:

1. A description of the part, obtained from the parts list.
2. The 3M catalog number.
3. The manufacturer's part number.
4. The schematic reference designator, if applicable, given on the applicable schematic and on the parts list.

5. The part or type number of the major assembly as shown on the nameplate, and the serial number of that assembly.
6. The 3M sales order number applying to the complete system or order.

The following table lists each of the parts lists included in this manual. To locate a parts list, determine the part number or assembly name and locate it in the following table. The referenced page number may then be used to find the parts list.

Table 10. Parts List Index

Part No.	Description	Catalog No.	Page
23000A010-1	Interconnecting Cable Assembly	83-4570-0382	124
23000A010-4	Interconnecting Cable Assembly	83-4570-0385	125
23000B020-2	Head Set Assembly-Rec/Rep/Erase, 2 Track	83-5950-1228	126
23000B020-4	Head Set Assembly-Rec/Rep/Erase, 4 Track	83-5950-1230	127
23000A951	Foot Switch Chassis Assembly	83-3310-1135	128
23004B000	Takeup Reel Motor Assembly	83-4560-0090	129
23004A050	Reel Motor Rewind Assembly	83-4560-0092	130
23004C010-5	15-30 IPS 50 Cycle Capstan Motor Assembly	83-4560-0159	131
23007A020-1	Idler Assembly, Reversing 1/2 Inch	83-4340-0318	132
23007A030-1	Tape Transport Head Cover Door Assembly	83-4330-0241	133
23007A040-1	Incoming Actuating Idler Arm Assembly	83-4340-0310	134
23007A040-2	Outgoing Actuating Idler Arm Assembly	83-4240-0311	135
23007A060-1	1/2" Tape Transport Capstan Assembly	83-5920-0819	136
23013A090-1	Left Hand Roller Idler Arm Assembly	83-4210-0230	137
23013A090-2	Right Hand Roller Idler Arm Assembly	83-4210-0231	138
23013A095	Head Cover Door Actuator Arm Assembly	83-4210-0237	139
23017A000	Optional Remote Control Assembly	83-5920-0823	140
23028A050	Cable Assembly, 36" 4 Track Power	83-4570-0346	142
23059B020	Bias Erase Printed Circuit Board Assembly	83-4930-2952	143
23059B030	NAB Erase Coupler Printed Circuit Board Assy	83-4930-2961	145
23059B040	NAB Record Printed Circuit Board Assembly	83-4930-1214	146
23059A060	Signal Electronics Line Amplifier Printed Circuit Board Assembly	83-4930-1091	148
23059B090-1	Overdub Preamplifier Printed Circuit Board Assembly, 7.5/15 IPS	83-4930-2180	150
23059B090-2	Overdub Preamplifier Printed Circuit Board Assembly, 15/30 IPS	83-4930-2511	152
23059A110	Extender Printed Circuit Board Assembly	83-4930-1746	153
56007A060-1	Motor Assembly - 7 1/2-15 ips 60 Hz	83-4560-0225	154
56007A060-2	Motor Assembly - 7 1/2-15 ips 50 Hz	83-4560-0227	155
56007B065-1	Motor Assy - Capstan 15-30 ips 60 Hz	83-4560-0283	156
56007B065-2	Motor Assy - Capstan 15-30 ips 50 Hz	83-4560-0284	157

Table 10. Parts List Index (Cont.)

Part No.	Description	Catalog No.	Page
64000A001	M64 Assy, 1/2" 4 Track, 7.5-15 ips 60 Hz	83-5996-4000	158
64000A002	M64 Assy, 1/2" 4 Track, 15-30 ips 60 Hz	83-5996-4001	175
64000A003	M64 Assy, 1/2" 4 Track 7.5-15 ips 50 Hz	83-5996-4002	176
64000A004	M64 Assy, 1/2" 4 Track 15-30 ips 50 Hz	83-5996-4003	
64000A005	M64 Assy, 1/4" 2 Track 7.5-15 ips 60 Hz	83-5996-4004	178
64000A006	M64 Assy, 1/4" 2 Track 15-30 ips 60 Hz	83-5996-4005	179
64000A007	M64 Assy, 1/4" 2 Track 7.5-15 ips 50 Hz	83-5996-4006	180
64000A008	M64 Assy, 1/4" 2 Track 15-30 ips 50 Hz	83-5996-4007	181
64013A060	PC Board Assembly - Logic Transport	83-4930-3065	182
64013A080	Chassis Assembly, Transport Elec. 1/4"	83-5920-1856	185
64013A085	Chassis Assembly, Transport Elec. 1/2"	83-5920-1857	191
64028A020-1	Cable Assy - Meter Display 4 Track	83-4570-0805	192
64028A020-2	Cable Assy - Meter Display 2 Track	83-4570-0806	193
64028A040	Cable Assembly - Stepdown Trans. 4 Track	83-4570-0803	194
64031A000-1	Power Supply-Elect. 4 Track	83-5920-1821	195
64031A000-2	Power Supply - Elect. 2 Track	83-5920-1822	197
64059A010	Housing Assembly Signal Electronics	83-4930-2980	199

MFG PARTS LIST

TITLE CABLE ASSY-INTERCONN,PD,1 TRK		CATALOG NO.	83-457C-0382	PL	23000A010-1	REV
REF.DES./FIND #	---EFF--- REG. END.	DRAWING NUMBER - MFG PART NO.	MFG NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.
000001		MRAC42S-G7	WINCHESTER	CONN-RECP, RECTANGLR, 42 CON	83-1610-0817	1
000002		100-2020S	WINCHESTER	SOCKET-CCN, CONN, .766 LG, 20 GA	83-1610-0818	1
000003		23000A011	B MINCOM	BRKT MTG-HEAD CONNECTOR	83-3320-1468	2
000004		00000A499-57	LLOYD WEST C	MARKER-IDENT, CABLE, UNMARKED	83-3550-1271	3
000005		23000A015	MINCOM	CABLE ASSY-INTERCONN, HDS	83-4570-0345	1
000006			NATL WIRE	WIRE-TYPE B, 22GA BLU NYLON JKT	83-7910-0044	AR
000007		TYPE YQE-91	BURNDY	SPLICE-ELECTRICAL CONDUCTOR	83-9630-0470	1

LAST OF 2 PAGES

M E G P A R T S L I S T

TITLE	CABLE ASSY-INTERCCNN,HDS,4 TRK	CATALOG NO.	83-457C-C385	PL	23000A010-4	REV
REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MFCR NAME	D E S C R I P T I O N		PH CATALOG NUMBER QTY.
	REF. END.	- MFCR PART NO.				
000001		MRAC42S-G7	WINCHESTER	CONN-RECP,RECTANGLR,42 CON		83-1610-0817 1
000002		100-2020S	WINCHESTER	SOCKET-CCN,CCNN,.766 LG,20 GA		83-1610-0818 1
000003		23000A011	B MINCOM	BRKT MTC-HEAD CONNECTOR		83-3320-1468 2
000004		00000A499-57	LLOYD WEST C	MARKER-IDENT,CABLE,UNMARKED		83-3550-1271 12
000005		23000A015	MINCOM	CABLE ASSY-INTERCCNN,HDS		83-4570-0345 4
000006			NATL WIRE	WIRE-TYPE B,22GA BLU NYLON JKT		83-7910-0044 AR
000007		TYPE YQF-S1	BLRNDY	SPLICE-ELECTRICAL CCNDUCTOR		83-9630-0470 1

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE HD SET ASSY-REC/REP/FRASE,2 TK

CATALOG NO. 83-595C-1228

PL 23000B020-2

REV E

REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	REF. FND.	- MEGR PART NO.				
000004		23002A001-1	C MINCOM	SHIELD-HEAD, REPRODUCE	83-3950-1105	1
000006		23001B010-1	MINCOM	MTG PLATE ASSY-REC/REP, 1/2 IN	83-5950-1236	1
000007	1548	23001AC60	R MINCOM	FINAL HC ASSY-2TK, REC AUD 1/4	83-4950-1454	1
000008	1548	23002AC50	C MINCOM	FINAL HC ASSY-2TK REP AUD 1/4	83-4950-1455	1
000009	1548	23101AC60	B MINCOM	FINAL PC ASSY-2TK FRASE AUD 1/4	83-4950-1456	1
000010		MS35206-204	MIL STD	SCREW-MACH, PAN HD, 2-56 X 5/16	83-9260-4503	4
000011		MS35206-205	MIL STD	SCREW-MACH, PAN HD, 2-56 X 3/8	83-9260-4504	2
000013				WASHER-FLAT, SM PATT, #2	83-9261-4011	6
000016		MS35338-39	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #2	83-9261-4301	6
000017		100-2020P	WINCHESTER	PIN-CONTACT, CONN, .040 DIA X.766	83-1610-0918	11

LAST OF 2 PAGES

M E G P A R T S L I S T

TITLE		HD SET ASSY-REC/REP/ERASE,4 TK		CATALOG NO.	83-5950-1230	PL	230008020-4	REV	E
REF.DFS./FIND #	---	EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER	QTY.	
	BEG.	END.	- MEGR PART NO.						
000004			23002A001-1	C MINCOM	SHIFLD-HEAD, REPRODUCE		83-3950-1105	1	
000006			230018010-1	MINCOM	MTG PLATE ASSY-REC/REP,1/2 IN		83-5950-1236	1	
000007	1548		23001A020	C MINCOM	FINAL HC ASSY-4TCK,REC, PAR		83-4950-1356	1	
000008	1548		23002A110	B MINCOM	FINAL HC ASSY-4 TK,1/2, REP		83-4950-1294	1	
000009	1548		23101A050	B MINCOM	FINAL HC ASSY-4TCK,ERASE PAR		83-4950-1410	1	
000010			MS35206-204	MIL STD	SCREW-MACH,PAN HD,2-56 X 5/16		83-9260-4503	4	
000011			MS35206-205	MIL STD	SCREW-MACH, PAN HD,2-56 X 3/8		83-9260-4504	2	
000013					WASHER-FLAT,SM PATT,#2		83-9261-4011	6	
000016			MS35338-39	MIL STD	WASHER-LOCK,SPLIT,HFLICAL,#2		83-9261-4301	6	
000017			100-2020P	WINCHESTER	PIN-CONTACT,CONN,.040DIA X.766		83-1610-0918	21	

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CHASSIS-SWITCH ASSY, FCCT

CATALOG NO. 83-3310-1135

PL 23000A951

REV A

REF. DES. / FIND # ---EFF---
REF. END.DRAWING NUMBER
- MFG PART NO.

MFG NAME

D E S C R I P T I O N

PP CATALOG NUMBER QTY.

000001
000002FF-832
1591BPFNN ENGRNG NUT-CLINCH, SELF LOCK, 8-32UNC
USECO FASTENER-CHAS, TAP, 4-40 X .10583-9264-0431
83-9262-02653
4

LAST OF 2 PAGES

M E G P A R T S L I S T

TITLE MOTOR ASSY-TAKE UP REEL CATALOG NO. 83-4560-0237 PL 230048000 REV B

REF.DES./FIND # ---DEF--- DRAWING NUMBER MGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
 REG. END. - MGR PART NO.

PO	1-480277-C	AMP INC	SHELL-CAN,RECT, .850 WD X.905	83-1610-0930	1
000001	LESS-10-1/3	MIN PREC BRG	BRG-BALL,ANLR,PLAIN, .625 BORE	83-1230-0331	1
000002	40618-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA	83-1610-0925	4
000003	23004A004	R MINCOM	ADAPTER-REEL HUB,REWIND MOTOR	83-3240-0303	1
000004	23004A003	A MINCOM	PLATE-MTG,TAKE UP & REWIND MOT	83-3320-1105	1
000005	56004A106	R MINCOM	TERM-LUG, MOD	83-3630-0600	2
000006	56004A105	A MINCOM	INDICATOR-FLAG, DIR SENSOR	83-3550-1825	1
000007	23004A005	A MINCOM	MOTOR-TAKE UP & REWIND,REEL	83-3560-0091	1
000008	56004A020	R MINCOM	PC BD ASSY-DIRECTION SENSOR	83-4930-2825	1
000009	MS35206-231	MIL STD	SCREW-MACH,PAN HD,6-32 X 5/8	83-9260-4535	2
000010	MS24602-S272	MIL STD	SCREW-MACH,FH,10-32 X 1/2	83-9260-6294	4
000011	MS51017-25	MIL STD	SETSCREW-CUP PT,8-32 X 1/4	83-9261-0069	3
000012	MS27183-6	MIL STD	WASHER-FLAT,GENERAL PURPOSE,#6	83-9261-4004	AR
000013	MS35239-41	MIL STD	WASHER-LOCK,SPLIT, #6	83-9261-4305	AR
000014	H-31	HAMLIN	MAGNET-PERMANENT, BAR,600-800	83-1190-0061	1
000015			NUT-HEX,SM PATT,6-32 X .250 WD	83-9260-2202	2
000016	4772	HH SMITH	CLAMP-STRAIN, .188 ID	83-7650-0101	1

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE MOTOR ASSY-REWIND, REEL

CATALOG NO. 83-4560-0092

PL 23004A050

REV B

REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
REG. FND.		- MEGR PART NO.				
000001		60618-4	AMP INC	CONTACT-ELEC, PIN, .084 DIA	83-1610-0925	4
000002		1-480276-0	AMP INC	SHELL-CAN, RECT, .665 WD X.85C	83-1610-0929	1
000003		23004A004	R MINCOM	ADAPTER-REEL HUB, REWIND MOTOR	83-3240-0303	1
000004		23004A003	A MINCOM	PLATE-MTG, TAKE UP & REWIND MOT	83-3320-1105	1
000005		23004A005	A MINCOM	MOTOR-TAKE UP & REWIND, REEL	83-3560-0091	1
000006		MS24693-S272	MIL STD	SCREW-MACH, FH, 10-32 X 1/2	83-9260-6294	4
000007		MS51017-35	MIL STD	SETSCREW-CUP PT, R-32 X 1/4	83-9261-0069	3
000008		23013A063-1	A MINCOM	SPG-FXPAN, RET, CAPSTAN, 1.810 LG	83-3280-0524	1
000009		7166	WALSCO	TERM-LUG, UNINS, FLAT, #6	83-9630-0028	4

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE MOTOP ASSY-CAPSTAN,15-30,50 CY CATALOG NO. 83-456C-C159 PL 23007C010-5 REV H
 REF.DES./FIND # ---EFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
 BFG. END. - MFGR PART NO.

C64	DP570	SPRAGUE	CAP-FXD,ELEC,5 MF 370VAC 10%	83-1510-2243	1
P8	1-480277-0	AMP INC	SHELL-CCNN,RECT, .850 WD X.905	83-1610-0930	1
R63	0367	OHMITE	RES-ADJ, WW, 75 OHM 25W 10%	83-1520-8306	1
000001	302C920P117	G.E.	RETAINER-CAP,FCOTED,2.625 HT	83-1650-0627	2
000002	MS35206-289	MIL STANDARD	SCREW-MACH,PAN HD,1/4-20 X 2.5	83-9260-4583	1
000003	NAS620-416	NAS STD	WASHER-FLAT,SM PATT,#1/4	83-9261-4043	1
000004	MS35338-44	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#1/4	83-9261-4309	1
000005	2154	H.H. SMITH	INSULATOR-WASH, FIBER,.250 ID	83-9630-0046	2
000006			SCREW-MACH,PAN HD,8-32 X 9/16	83-9260-4552	2
000007	23007A017	D MINCOM	BRACKET-CAPACITOR MTG	83-3320-1582	1
000008	MS35206-261	MIL STD	SCR-MACH,PAN HD,10-24 X 3/8 LG	83-9260-4588	3
000009	MS27183-8	MIL STD	WASHER-FLAT,GENERAL PURPOSE,#10	83-9261-4006	3
000010	MS35338-43	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#10	83-9261-4307	3
000011	6061R-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA	83-1610-0925	8
000012	6128	LERCO	TERMINAL-INSUL,.250 OD,4-40	83-9630-0137	1
000013	23007AC15-6	E MINCOM	PULLEY-CAPSTAN DRIVE,1.503 DIA	83-3220-0191	1
000014	23007A011-3	MINCOM SPEC	MOTOR-CAPSTAN DRIVE,	83-1560-0156	1
000015	NS001-31	TRUARC	RING-RETNG,INT, .346 OD	83-7270-0598	1
000016	MS35206-245	MIL STD	SCREW-MACH,PAN HD,8-32 X 1/2	83-9260-4551	1
000017	MS35338-42	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#8	83-9261-4020	1
000018	MS27183-7	MIL STD	WASHER-FLAT,PD,#8,GEN PURPOSE	83-9261-4038	1
000019	MS35449-42	MIL STD	NUT-HEX,PLAIN,4-40 X .250 WD	83-9260-2003	1
000020	MS35338-40	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#4	83-9261-4303	1
000021	MS27183-4	MIL STD	WASHER-FLAT,GENERAL PURPOSE #4	83-9261-4002	1

LAST OF 2 PAGES

M64 PAR 2-71

PAGE NO. 2

M E G P A R T S L I S T

02/16/71

132

TITLE IDLER ASSY-REVERSING, 1/2 INCH

CATALOG NO. 83-4240-0318

PI 23007A020-1

REV K

REF. DES. / END #	---EE--- REQ. END.	DRAWING NUMBER - MEG PART NO.	MEGR NAME	D E S C R I P T I O N	PI CATALOG NUMBER	QTY.
000001		SEE DESC	S	MIN PREC BRG BRG-SR4FRHH7P25-LG20-ZD-1-1	83-1230-0204	2
000002		2-16-EE40-8		PARKER SEAL PKG-PREFORM, .750 OD	83-1290-0130	1
000003		23007A024-1		MINCOM SPACER-BEARING, REV IDLR, .33 LG	83-3230-0307	1
000004		23007A021-1	C	MINCOM IDLER-REVERSING, 1/2 INCH TAPE	83-3240-0320	1
000005		23007A022-1		MINCOM BASE-MTG, REVERSING IDLER, 1/2 IN	83-3240-0321	1
000006	417	23007A023-3	C	MINCOM CAP-IDLER, REVERSING	83-3250-0141	1
000007		102206204		LONG-LOK SCREW-SELF LKG, 6-32 X 1/4	83-9260-0165	1
000008				WASHER-FLAT, SM PATT, #6	83-9261-4013	1

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE DOOR ASSY-HEAD COVER,TPF TRANS

CATALOG NO. 83-4330-0241

PL 23007A030-1

REV D

REF.DES./FIND # ---FFF--- DRAWING NUMBER MFG NAME DESCRIPTION PH CATALOG NUMBER QTY.
REF. END. - MFG PART NO.

000002	23007A032	B MINCOM	SHAFT-ACTUATING,DOOR,HEAD COVR	83-3280-0406	1
000003	23007C034-1	A MINCOM	DOOR-HEAD COVER	83-3330-0436	1
000004	23007A033	A MINCOM	SUPPORT-DOOR,HD CVR,TAPE TRANS	83-3340-0381	1
000005	23007A036-1	B MINCOM	SHIELD-DOOR, HEAD COVER	83-3650-0367	1
000006	GP24-125X312	GROOV-PIN	PIN-GRVC,HDLs,.125DIA X.312 LG	83-7280-0466	1
000007	#0	GRCOV-PIN	PIN-GRVC,FDED,.067 DIAx.125LG	83-7280-0477	2

LAST OF 2 PAGES

M64 PAR 2-71

134

M E G P A R T S L I S T

TITLE ROLLER ASSY-IDLER, 1/2 IN INCOM		CATALOG NO. 83-4240-0310	PL 23007A040-1	REV D		
REF.DES./FIND #	---FFF---	DRAWING NUMBER	MEGR NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.
	REG. FND.	- MEGR PART NO.				
000001		SEE DESC		BRG-BALL, S814FCZ77LG31ZD-1-1	83-1230-0325	2
000002		23007A041-1	B MINCOM	ROLLER-IDLER, 1/2 INCH, INCOMING	83-3240-0312	1
000003		23007A042-1	C MINCOM	SHAFT-IDLER, ROLLER MTG	83-3280-0388	1
000004		C2133-020-4		RING-RETNG, EXT, .224 ID	83-7270-0506	1

LAST OF 2 PAGES

M64 PAR 2-71

M E G P A R T S L I S T

TITLE POLLER ASSY-IDLER,1/2 IN OUTGNG

CATALOG NO. 83-4240-0311

PL 23007A04C-2

REV D

REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	REG. ENC.	- MEGR PART NO.				

000001		SEE DFSC		BRG-BALL,S814FCZZ7LG31ZD-1-1	83-1230-0325	2
000002		23007A041-2	B MINCOM	ROLLER-IDLER,1/2 INCH,OUTGOING	83-3240-0313	1
000003		23007A042-1	C MINCOM	SHAFT-IDLER,ROLLER MTG	83-3280-0388	1
000004		C2133-020-4		RING-RETNG, FXT, .224 ID	83-7270-0506	1

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CAPSTAN ASSY-TAPE TRANS, 1/2 IN

CATALOG NO. 83-5920-0819

PL 23007A060-1

REV G

REF.DES./FIND # ---FFF--- DRAWING NUMBER MFG NAME DESCRIPTION PH CATALOG NUMBER QTY.
 PFG. FND. - MFG PART NO.

000001	10353CG-2	BARDEN	BRG-BALL, PLAIN, ANLR, .6693 BORE	83-1230-0313	1
000002	103HDB5CG-2	BARDEN	BRG-BALL, PLAIN, .6693 BORE	83-1230-0335	1
000004	23007A063-1	E MINCOM	TAPE CR-CAPSTAN, 1/2 IN TAPE	83-3240-0292	1
000005	19007AC22	D MINCOM	CAP-FLYWHEEL, PRECISION PLATE	83-3250-0082	1
000007	23007AC64-1	F MINCOM	SHAFT-CAPSTAN, TAPE DRIVE, 1/2 IN	83-3280-0409	1
000008	23007AC62	D MINCOM	HOUSING-CAPSTAN, TAPE DRIVE	83-3310-0836	1
000009	MS16625-137	MIL STD	RING-RETNG, INT, 1.486 OD	83-7270-0382	1
000011	00000A816	B MINCOM	RING-RETNG, INT, 1.526 FREE OP	83-3270-0768	1
000012			SCR-CAP, FH, 1/4X20X5/8, NYLOC	83-9262-0569	1
000013	23007ACC9-1	B MINCOM	SHIM-CAPSTAN, .002 THK	83-3230-0340	AR
000014	23007ACC9-2	B MINCOM	SHIM-CAPSTAN, .005 THK	83-3230-0368	AR
000015	23007ACC9-3	B MINCOM	SHIM-CAPSTAN, .010 THK	83-3230-0369	AR

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE		CATALOG NO.		PL		REV	
ARM ASSY-IDLER,ROLLER,LH		83-421C-0230		23013A090-1		B	
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER	QTY.
	BFG. END.	- MEGR PART NO.					
000001	398	23013AC57	3M	CASTING-ARM,ROLLER,IDLER		83-3140-0157	1
000002		23013A012	MINCOM	PIN-ACTUATOR,IDLER ARM		83-3280-0408	1
000003		GP67-125X500-12	GRONV-PIN	PIN-GRVC,HDL5, .125 DIA X .500 LG		83-7280-0202	1
000004		CLS-440-3	PENN ENGRNG	NUT-CLINCH,PLAIN,4-40 X .250 WD		83-9264-0005	1

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE ARM ASSY-IDLER,RCLLER,PH

CATALOG NO. 83-4210-0231

PL 23013A090-2

REV B

REF.DES./FIND #	---FFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
REG. ENC.		- MEGR PART NO.				
000001	398	23013AC57	3M	CASTING-ARM,RCLLER,IDLER	83-3140-0157	1
000002		23013A012	MINCOM	PIN-ACTUATOR,IDLER ARM	83-3280-0408	1
000003		GP67-125X500-12	GRCCV-PIN	PIN-GRVC,FOLS, .125 DIA X .500LG	83-7280-0202	1
000004		CLS-440-3	PFNN ENGRNG	NUT-CLINCH,PLAIN,4-40 X .250WD	83-9264-0005	1

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE ARM ASSY-ACTUATOR, DOOR HD CVR

CATALOG NO. 83-4210-0237

PL 23013A095

REV B

REF.DES./FIND #	---FFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
BEG. FND.		- MFGR PART NO.				

000001		23007A031	C MINCOM	LEVER-DCCR, HEAD COVER	83-3210-0202	1
000002		23007A035	C MINCOM	BRACKET-LEVER MTG, DASHPOT	83-3320-1049	1

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CONTROL ASSY-REMOTE,OPTIONAL		CATALOG NO.	83-592C-0823	PL	23017A000	REV	C
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	DESCRIPTION		PH CATALOG NUMBER	QTY.
	BEG. END.	- MFGR PART NO.					
DS1,DS2,DS3,DS4, DS5 DS6		327	GENERAL	FLFC LAMP-INCANDESCENT, .04 AMP		83-1550-2506	5
		1-380672-4	AMP INC	LIGHT ASSY-PILOT,AMBER,24VOLTS		83-1550-2590	1
PI		201359-3	AMP INC	SHELL-COAN,RECT,26 POSITIONS		83-1610-0674	1
S1,S2,S3,S4,S5 S6,S7		1018P	PENDAR	SWITCH-PUSHBUTTON,SPDT,MOMENTY		83-1550-5177	5
		513-0101-604	DIALCO	SWITCH-MOMENTARY,MAKE		83-1550-5233	2
000001		23017AC01	MINCOM	PANEL-SWITCH, MODE CONTROL		83-3360-0975	1
000002		23017AC02	MINCOM	HOUSING-MODE CONTROL		83-3310-1039	1
000003		23017AC03	C MINCOM	CHASSIS-SWITCH, MODE CONTROL		83-3310-1040	1
000004		42980-1-LP	4 AMP INC	PIN-CONTACT,COAN,20-24 GA WIRE		83-1610-0698	15
000005		42452-1	AMP INC	CONT-ELECT, SOCKET CLIP,.220 WD		83-1610-0847	2
000006		201923-1	AMP INC	CLIP-SPRING TENSION, MALE		83-1620-0126	1
000007		201229-1	AMP INC	CLAMP-ELFC, STRAIN REL,.779 MCE		83-1650-0244	1
000008		00000A769	C MINCOM	LABEL-IDENTIFICATION,MODULE		83-3550-1621	1
000009		200389-4	AMP INC	PIN-GUIDE,CENTER,AMP SERIES M		83-7280-0196	1
000010		TY15	THOMS & BETS	CLAMP-LCOP,NYLON TYRAP,7.81 LG		83-7650-0056	1
000011		8748	BFLDEN	WIRE-TYPE 8748, 22 GA,18CONDU		83-7910-0534	AR
000012		200390-4	AMP INC	REC-GUIDE PIN,CENTER,SERIES M		83-7270-0302	1
000013		#7	RUPBERCRAFT	GROMMET-RUBBER,.375ID X.687 OD		83-9630-0097	1
000014		MS35206-229	MIL STD	SCREW-MACH,PAN HD,6-32 X 7/16		83-9260-4532	5
000015		MS24693-S25	MIL STD	SCREW-MACH,FH,6-32 X 5/16		83-9260-6555	2
000016		MS35338-41	MIL STD	WASHER-LOCK,SPLIT, #6		83-9261-4305	5
000017				WASHER-FLAT,SM PATT,#6		83-9261-4013	5
000018	520	16049B015-1	A MINCOM	LENS-INC LIGHT, *REWIND*		83-3550-1982	1
000019	520	16049B015-2	A MINCOM	LENS-INC LIGHT, *FORWARD*		83-3550-1983	1
000020	520	16049B015-3	A MINCOM	LENS-INC LIGHT, *RECORD*		83-3550-1984	1
000021	520	16049B015-4	A MINCOM	LENS-INC LIGHT, *PLAY*		83-3550-1985	1
000022	520	23013BC38	A MINCOM	LENS-INC LIGHT, *STOP*		83-3550-1981	1
000023		185-1873	DIALCO	LENS-CAP ASSY,1/2 IN SQ,AMBER		83-1550-5243	1

M64 PAR 2-71

M E G P A R T S L I S T

TITLE CONTROL ASSY-REMOTE,OPTIONAL		CATALOG NO. 83-5920-0823	PL 23017A000	REV C
REF.DFS./FIND # ---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER QTY.
BEG. END.	- MEGR PART NO.			
000074	185-1872	DIALCO	LENS-CAP ASSY,1/2 IN SQ,GREEN	83-1550-5244 1
LAST OF 3 PAGES				

M64 PAR 2-71

M F G P A R T S L I S T

REF. DES. / FIND #	---FFF--- REG. END.	DRAWING NUMBER - MFG PART NO.	MFG NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
000001		60618-4	AMP INC	CONTACT-ELEC, PIN, .084 DIA	83-1610-0925	51
000002		1-480278-0	AMP INC	SHELL-CAN, RECT, 12 POSITIONS	83-1610-0931	1
000003		1-480324-0	AMP INC	SHELL-CAN, RECT, 15 POSITION	83-1610-0933	4
000004			NATL WIRE	WIRE-PVC, TYPE B, 22GA YELLOW	83-7910-0040	AR
000005			NATL WIRE	WIRE-TYPE B, 22GA VIO NYLON JKT	83-7910-0041	AR
000006			NATL WIRE	WIRE-PVC, TYPE B, 22GA GRAY	83-7910-0042	AR
000007			NATL WIRE	WIRE-TYPE B, 22GA BLU NYLON JKT	83-7910-0044	AR
000008			NATL WIRE	WIRE-TYPE B, 22GA BLK NYLON JKT	83-7910-0045	AR
000009			NATL WIRE	WIRE-TYPE B, 22GA, GRN NYLN JKT	83-7910-0248	AR
000010			NATL WIRE	WIRE-TYPE B, 22GA RED NYLON JKT	83-7910-0249	AR
000011			NATL WIRE	WIRE-TYPE B, 22GA, BRN NYLN JKT	83-7910-0251	AR
000012		3025-070-5/16 ID 3M		TUBING-SCOTCHTITE, CLEAR VINYL	83-7910-0279	AR
000013		NB1934N2SJ	NATL WIRE	WIRE-TYPE B, 22GA RED/BLU 2 CON	83-7910-0362	AR
000014		GSC134C	THOM & BETTS	FERRULE-RF CABLE GND .1341C	83-9690-0020	8
000015		GSC194C	THOMAS & BETTS	FERRULE-RF CABLE GROUNDING	83-9690-0118	8
000016			NATL WIRE	WIRE-TYPE B, 22 GA ORNG NYL JKT	83-7910-0250	AR

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE PC RD ASSY-BIAS ERASE

CATALOG NO. 83-4930-2952

PL 23059B020

REV C

RFF.DES./FIND # ---EFF---
BEG. END.DRAWING NUMBER
- MFG PART NO.

MFG NAME

D E S C R I P T I O N

PH CATALOG NUMBER QTY.

C1	112A1A104M	HOPKINS	CAP-FXD,PAPER, .10UF, 50V,20%	83-1510-4185	1
C2	107X002	SPRAGUE	CAP-FXD,TA, 100 UF, 25V, 20%	83-1510-6222	1
C3,C20	TSD5-35-156	COMP INC	CAP-FXD, TA, 15UF 35V 20%	83-1510-6209	2
C4,C5	210818103J	ELECTRO CUBE	CAP-FXD,PLSTC, .01UF,100V, 5%	83-1510-4192	2
C6,C7,C8,C9	TSD-1-20-225	CCMP INC	CAP-FXD,TA, 2.2UF 20V 20%	83-1510-6240	4
C10,C13,C16	192P10392	SPRAGUE	CAP-FXD,PAPER, .01 UF,200V,10%	83-1510-4414	3
C12,C15	TSD3-15-226	CCMP INC	CAP-FXD,TA, 22UF 15V 20%	83-1510-6257	2
C14,C17	192P33292	SPRAGUE	CAP-FXD,PAPER,.0033UF,200V,10%	83-1510-4405	2
C18	WMF1547	CORNEL-DUBLR	CAP-FXD,PLSTC,.047UF 100V 10%	83-1510-4481	1
C19	SEE DESC	ERIE	CAP-FXD,270PF,831-000-X5F-271K	83-1510-1103	1
C21	4610	ARCO	CAP-VAR,MICA,190-900 PF	83-1510-6252	1
CR1,CP2,CR3	1N270	HUGHES	DIODE-GE,GEN PUR,1COPIV, 60 MA	83-1530-0263	3
L1	4631	J.W. MILLER	INDUCTOR-FXD,82UH,250MA	83-1540-0409	1
L2	70F333AI	J.W. MILLER	CHNKE-RF,3.3 MH 5 %	83-1540-0410	1
Q1,Q2,Q5,Q6	2N3053	R.C.A.	TSTR-SI,NPN, PWR, 60 VCB	83-1530-2180	4
Q3,Q4	2N3054	R.C.A.	TSTR-SI,NPN, H PWR, 100 PFE	83-1530-2227	2
R1,R14,R17	0A781-7221	MINCOM SPEC	RES-FXD,FILM,100 OHM,1/2W,2% S	83-1520-7221	3
R2	0A781-7358	MINCOM SPEC	RES-FXD,FILM,820 OHM,1/2W,2% S	83-1520-7358	1
R3	3282W-1-102	BOURNS INC	RES-VAR,COMP, 1 K OHM 1W 10%	83-1520-1401	1
R4	0A781-7175	MINCOM SPEC	RES-FXD,FILM,1K OHM,1/2W,2% S	83-1520-7175	1
R5,R27	0A781-7144	MINCOM SPEC	RES-FXD,FILM,15K OHM,1/2W,2% S	83-1520-7144	2
R6,R8	0A781-7360	MINCOM SPEC	RES-FXD,FILM,2.2K OHM,1/2W,2% S	83-1520-7360	2
R7,R28	0A781-7145	MINCOM SPEC	RES-FXD,FILM,12K OHM,1/2W,2% S	83-1520-7145	2
R9,R10	0A781-7355	MINCOM SPEC	RES-FXD,FILM,560 OHM,1/2W,2% S	83-1520-7355	2
R11,R12	0A781-7337	MINCOM SPEC	RES-FXD,FILM,47 OHM,1/2W,2% S	83-1520-7337	2
R13	0A781-7363	MINCOM SPEC	RES-FXD,FILM,3.9K OHM,1/2W,2% S	83-1520-7363	1
R15,R18	0A781-7329	MINCOM SPEC	RES-FXD,FILM,22 OHM,1/2W,2% S	83-1520-7329	2
R16	0A781-7146	MINCOM SPEC	RES-FXD,FILM,18K OHM,1/2W,2% S	83-1520-7146	1
R19,R22	0A781-7331	MINCOM SPEC	RES-FXD,FILM,27 OHM,1/2W,2% S	83-1520-7331	2

M64 PAR 2-71

M F G P A R T S L I S T

TITLE PC BD ASSY-BIAS ERASE		CATALOG NO. 83-4930-2952		PL 23059B02C	REV C
REF.DES./FIND #	---EFF--- BEG. ENC.	DRAWING NUMBER - MFG PART NO.	MFG NAME	D E S C R I P T I O N	PH CATALOG NUMBER QTY.
R20,R21		0A781-7147	MINCOM SPEC	RES-FXD,FILM,4.7K OHM,1/2W,2%	83-1520-7147 2
R23		3067P-1-502	BOURNS	RES-VAR, WW, 5K OHM 1/2W 10%	83-1520-1319 1
R24		77PR10K	BECKMAN	RES-VAR,COMP,10K OHM,3/4 W,10%	83-1520-1213 1
R25		77PR1K	BECKMAN	RES-VAR,COMP,1K OHM,3/4 W, 10%	83-1520-1211 1
R26		0A781-7379	MINCOM SPEC	RES-FXD,FILM,47K OHM,1/2W,2% S	83-1520-7379 1
R29		0A781-7325	MINCOM SPEC	RES-FXD,FILM,10 OHM,1/2W,2% S	83-1520-7325 1
T1		00000A718	A MINCOM	XFMR-TORROIDAL,ARNOLD CORE	83-3540-1150 1
T2,T4,T5		0000CA719	A MINCOM	XFMR-TORROIDAL,ARNOLD CORE	83-3540-1151 3
T3		00000A720	A MINCOM	XFMR-TORROIDAL,ARNOLD CORE	83-3540-1152 1
TP1		3-582118-9	APP INC	JACK-TIP,.156 WD X .460 DP	83-1610-0752 1
000001		23059B021	B MINCOM	PC BD-BIAS ERASE	83-3640-1877 1
000002		00000A667	B MINCOM	HANDLE-EJECTOR,P.C. BD,1.50 LG	83-3270-0371 1
000003		79-C22-094-0250	ESNA	PIN-SPRING, .094 DIA X .250 LG	83-7280-0270 1
000004		00000A734-1	B MINCOM	LABEL-ICENT,P.C. BD,MARKED *1*	83-3550-1446 1
000005		23059A016	A MINCOM	BRACKET-COMPONENT MTG,SIG ELEC	83-3320-1132 1
000006		#EXE-22-122	THERMAX	WIRE-TYPE C,22GA WHT TEFLN JKT	83-7910-0476 AR

LAST OF 3 PAGES

MFG PARTS LIST

TITLE PC BD ASSY-CONVERSION,NAB,REC		CATALOG NO.	83-4930-2961	PL	230598030	REV	A
REF.DES./FIND #	---EFF--- BEG. END.	DRAWING NUMBER - MFG PART NO.	MFG NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.	
C1		TYPE 311	ARCO	CAP-VAR,MICA,780-2110PF 250V	83-1510-6274	1	
C2		0A936-5028	MINCOM SPEC	CAP-FXD,MICA, 470 PF 500V 5%	83-1510-5028	1	
L1		WEE-1000	NYTRONICS	INDUCT-FXD,RF,1000 OH 140 MA	83-1540-0547	1	
R3		3067P-1-502	BOURNS	RES-VAR, WW, 5K OHM 1/2W 10%	83-1520-1319	1	
TP1		3-5E2118-9	AMP INC	JACK-TIF,.156 WD X .460 DP	83-1610-0752	1	
000001		230598031	B MINCOM	PC BD-CONVERSION,NAB,RECORD	83-3640-1886	1	
000002		30113A018-2	A MINCOM	SHIELD-CIRCUIT BD	83-3650-0387	1	
000003		00000A667	B MINCOM	HANDLE-EJECTOR,P.C. BD,1.50 LG	83-3270-0371	1	
000004		79-022-094-0250	ESNA	PIN-SPRING, .094 DIA X .250 LG	83-7280-0270	1	
000005		1434	BIRNBACH	WIRE-BUS,22GA ROUND	83-7910-0105	AR	
000006		MS35206-202	MIL STD	SCREW-PACH,PAN HD,2-56 X 3/16	83-9260-4501	4	
000007				WASHER-FLAT,GENERAL PURPOSE,#2	83-9261-4040	4	
000008		MS35238-39	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#2	83-9261-4301	4	
000009		00000A734-2	B MINCOM	LABEL-IDENT,P.C. BD,*3N*	83-3550-1447	1	
000010		NAS620-416	NAS STD	WASHER-FLAT,SM PATT,#1/4	83-9261-4043	2	

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE P.C. BD ASSY-RECORD,NAR

CATALOG NO. 83-4930-1214

PL 230598040

REV G

REF.DFS./FIND # ---EFF---
BFG. END.DRAWING NUMBER
- MFG PART NO.

MFG NAME

DESCRIPTION

PH CATALOG NUMBER QTY.

C1,C10,C14	TSD3-15-226	COMP INC	CAP-FXD,TA, 22UF 15V 20%	83-1510-6257	3
C2	W210B1V334J	ELECTRC CUBE	CAP-FXD,MYLAR,.33UF,150V, 5%	83-1510-4301	1
C3	112A1B683K	ELECTRO CUBE	CAP-FXD,PAPER,.068 UF,100V,10%	83-1510-4332	1
C4	112A1A104J	ELECTRO-CUBE	CAP-FXD,PAPER, .10UF 50V 5%	83-1510-4310	1
C5	17W8203J	JEDCO	CAP-FXD,PLSTC, .02UF,100V, 5%	83-1510-4191	1
C7	TSD-1-20-225	COMP INC	CAP-FXD,TA, 2.2UF 20V 20%	83-1510-6240	1
C8	F3FR-332-1C	MIDWEC	CAP-FXD,PLSTC,.0033UF 100V 5%	83-1510-4445	1
C9	TSD5-20-686	COMP INC	CAP-FXD,TA, 68UF 20V 20%	83-1510-6211	1
C11	TSD5-20-476	COMP INC	CAP-FXD,TA, 47UF 20V 20%	83-1510-6199	1
C12	TSD5-6-227	COMP INC	CAP-FXD,TA, 220UF 6V 20%	83-1510-6259	1
C13	TSD5-35-156	COMP INC	CAP-FXD,TA, 15UF 35V 20%	83-1510-6209	1
C15	TSD1-20-475	COMP INC	CAP-FXD,TA, 4.7UF 20V 20%	83-1510-6196	1
C17	210B1C102K	ELECTRO CUBE	CAP-FXD,PLSTC,.001 UF,200V,10%	83-1510-4296	1
C18,C19	464	ARCO	CAP-VAR,MICA,25 MMF-280 MMF	83-1510-6277	2
K1	701-3	ELEC-TROL	RELAY-SPDT, 2K OHM 24VDC	83-1550-3620	1
Q1,Q3,Q7	2N3391A	GENERAL ELEC	TSTR-SI,NPN, PWR, 25 VCR	83-1530-2230	3
Q2	2N3684		TSTR-SI,N-CHAN,FLD EFFECT 50MA	83-1530-2244	1
Q4	2N3405	G.E.	TSTR-SI,NPN,GEN PUR,50VCE	83-1530-2232	1
Q5,Q6	2N2614	RCA	TSTR-GE,PNP, SIGNAL, 40VCR	83-1530-2233	2
R1	0A781-7397	MINCOM SPEC	RES-FXD,FILM,390K OHM,1/2W,2% S	83-1520-7397	1
R2,R25	0A781-7372	MINCOM SPEC	RES-FXD,FILM,22K OHM,1/2W,2% S	83-1520-7372	2
R3	0A781-7148	MINCOM SPEC	RES-FXD,FILM,10K OHM,1/2W,2% S	83-1520-7148	1
R4	0A781-7175	MINCOM SPEC	RES-FXD,FILM,1K OHM,1/2W,2% S	83-1520-7175	1
R5	0A781-7174	MINCOM SPEC	RES-FXD,FILM,390 OHM,1/2W,2% S	83-1520-7174	1
R6,R24	0A781-7393	MINCOM	RES-FXD,FILM,270K OHM,1/2W,2% S	83-1520-7393	2
R7	0A781-7372	MINCOM SPEC	RES-FXD,FILM,27K OHM,1/2W,2% S	83-1520-7373	1
R8	0A781-7387	MINCOM SPEC	RES-FXD,FILM,100K OHM,1/2W,2% S	83-1520-7387	1
R9,R14	0A781-7369	MINCOM SPEC	RES-FXD,FILM,8.2K OHM,1/2W,2% S	83-1520-7369	2
R10	0A781-7360	MINCOM SPEC	RES-FXD,FILM,2.2K OHM,1/2W,2% S	83-1520-7360	1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE P.C. BD ASSY-RECCRD,NAB		CATALOG NO.	83-4930-1214		PL	23059B040	REV	G
RFF.DES./FIND #	---EFF--- RFG. END.	DRAWING NUMBER - MFGR PART NO.	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.		
12		0A781-7148	MINCOM SPEC	RES-FXD,FILM,10K OHM,1/2W,2% S	83-1520-7148	1		
13		0A781-7383	MINCOM SPEC	RES-FXD,FILM,68K OHM,1/2W,2% S	83-1520-7383	1		
15		0A781-7201	MINCOM SPEC	RES-FXD,FILM,1.8K OHM,1/2W,2% S	83-1520-7201	1		
16,R29		0A781-7147	MINCOM SPEC	RES-FXD,FILM,4.7K OHM,1/2W,2% S	83-1520-7147	2		
17		0A781-7359	MINCOM SPEC	RES-FXD,FILM,1.2K OHM,1/2W,2% S	83-1520-7359	1		
18		0A781-7342	MINCOM SPEC	RES-FXD,FILM,82 OHM,1/2W,2% S	83-1520-7342	1		
19	426	0A781-7327	MINCOM SPEC	RES-FXD,FILM,18 OHM,1/2W,2% S	83-1520-7327	1		
20		77PR100	BECKMAN	RES-VAR,COMP,100 OHM,3/4 W,10%	83-1520-1153	1		
21		0A781-7333	MINCOM SPEC	RES-FXD,FILM,33 OHM,1/2W,2% S	83-1520-7333	1		
22		0A781-7345	MINCOM SPEC	RES-FXD,FILM,180 OHM,1/2W,2% S	83-1520-7345	1		
23		0A781-7379	MINCOM SPEC	RES-FXD,FILM,47K OHM,1/2W,2% S	83-1520-7379	1		
26		0A781-7367	MINCOM SPEC	RES-FXD,FILM,6.8K OHM,1/2W,2% S	83-1520-7367	1		
27		0A781-7220	MINCOM SPEC	RES-FXD,FILM,220 OHM,1/2W,2% S	83-1520-7220	1		
28		0A781-7350	MINCOM SPEC	RES-FXD,FILM,330 OHM,1/2W,2% S	83-1520-7350	1		
30		77PR10K	BECKMAN	RES-VAR,COMP,10K OHM,3/4 W,10%	83-1520-1213	1		
1		TYPE G350-PC	CENTL WIRT	SWITCH-SLIDE, DPDT,125V 3AMP	83-1550-5212	1		
TP1		3-582118-9	AMP INC	JACK-TIF,.156 WD X .460 DP	83-1610-0752	1		
TP2		3-582118-0	AMP INC	JACK-TEST,.156WD X .230 HT,BLK	83-1610-0765	1		
000001		0000CA667	B MINCOM	HANDLE-EJECTOR,P.C. BD,1.50 LG	83-3270-0371	1		
000002		23059A016	A MINCOM	BRACKET-COMPONENT MTG,SIG ELEC	83-3320-1132	2		
000003		00000A734-3	B MINCOM	LABEL-ICENT,P.C.BD, #4*	83-3550-1448	1		
000004		23059B041	F MINCOM	P.C. BD-RECORD,NAB	83-3640-0729	1		
000005		79-022-094-0250	ESNA	PIN-SPRING, .094 DIA X .250 LG	83-7280-0270	1		
000006		7717-2	THERMALLOY	PAD-TSTR, INLINE, 3 LEADS	83-9690-0191	3		
000007		MS35206-215	MIL STD	SCREW-MACH,PAN HD,4-40 X 3/8	83-9260-4515	1		
000008		MS35649-42	MIL STD	NUT-HEX,PLAIN,4-40 X .250 WD	83-9260-2003	1		
000009		MS27183-4	MIL STD	WASHER-FLAT,GENERAL PURPOSE #4	83-9261-4002	1		
000010		MS35338-40	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#4	83-9261-4303	1		
000012		1434	RIENBACH	WIRE-BUS,22GA ROUND	83-7910-0105	AR		

LAST OF 3 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE	P.C. BD ASSY-LNE AMP, SIG ELEC	CATALOG NO.	83-493C-1091	PL	23059A060	REV	J
REF.DES./FIND #	---FFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.	
	PEG. FND.	- MEGR PART NO.					
C1		TSD5-35-156	COMP INC	CAP-FXC, TA, 15UF 35V 20%	83-1510-6209	1	
C2, C6		TSD4-20-226	COMP INC	CAP-FXD, TA, 22UF 20V 20%	83-1510-6203	2	
C3		625B1R103J	ELECTRO CUBF	CAP-FXC, MYLAR, .01 UF, 100 V	83-1510-4227	1	
C4, C5		977-123	GEN INSTR	CAP-FXC, ELECT, 150UF 50V	83-1510-2212	2	
C7		TSD5-20-476	COMP INC	CAP-FXD, TA, 47UF 20V 20%	83-1510-6199	1	
C8		0A836-5148	MINCOM SPEC	CAP-FXC, MICA, 50PF 500V 5%	83-1510-5148	1	
C9		TSD1-35-105	COMP INC	CAP-FXD, TA, 1UF 35V 20%	83-1510-6208	1	
C10		TSD5-10-157	COMP INC	CAP-FXD, TA, 150UF 10V 20%	83-1510-6245	1	
C11, C12		DD102	AEROVOX	CAP-FXC, CER, 1000PF 1000V GMV	83-1510-1024	2	
C13		0A836-5214	MINCOM SPEC	CAP-FXC, MICA, 200PF 500V 5%	83-1510-5214	1	
C14		977-163	GEN INSTR	CAP-FXD, ELECT, 500UF 25V	83-1510-2044	1	
C15		210D1C224K	MINCOM	CAP-FXC, MY, .22 UF, 200 VDC, 10%	83-1510-4569	1	
CR1, CR2, CR3, CR4, CR5, CR6, CR7		IN4004	MOTOROLA	RECT -SI, DIF JCT, 400PIV 1 AMP	83-1530-0151	7	
Q1, Q2, Q3		2N3391A	GENERAL ELEC	TSTR-SI, NPN, PWR, 25 VCB	83-1530-2230	3	
Q4		2N3638	FAIRCHILD	TSTR-SI, PNP, SW, 25 VCB	83-1530-2155	1	
Q5, Q6		2N3054	R.C.A.	TSTR-SI, NPN, H PWR, 100 HFE	83-1530-2227	2	
R1	1545	0A781-7219	MINCOM SPEC	RES-FXD, FILM, 3K OHM, 1/2W, 2% S	83-1520-7219	1	
R2, R17, R21		0A781-7175	MINCOM SPEC	RES-FXC, FILM, 1K OHM, 1/2W, 2% S	83-1520-7175	3	
R3		0A781-7368	MINCOM SPEC	RES-FXD, FILM, 7.5K OHM, 1/2W, 2% S	83-1520-7368	1	
R4	1545	3067P-1-502	BOURNS	RES-VAR, WW, 5K OHM 1/2W 10%	83-1520-1319	1	
R5, R8, R15, R22		0A781-7148	MINCOM SPEC	RES-FXC, FILM, 10K OHM, 1/2W, 2% S	83-1520-7148	4	
R6		, LITTLE DEVIL	OHMITE	RES-FXD, COMP, 820K OHM 1/2W 5	83-9520-3218	1	
R7		0A781-7398	MINCOM SPEC	RES-FXC, FILM, 430K OHM, 1/2W, 2% S	83-1520-7398	1	
R9		0A781-7359	MINCOM SPEC	RES-FXD, FILM, 1.2K OHM, 1/2W, 2% S	83-1520-7359	1	
R10, R12		0A781-7221	MINCOM SPEC	RES-FXC, FILM, 100 OHM, 1/2W, 2% S	83-1520-7221	2	
R11		0A781-7346	MINCOM SPEC	RES-FXC, FILM, 200 OHM, 1/2W, 2% S	83-1520-7346	1	
R13		3067P-1-502	BOURNS	RES-VAR, WW, 5K OHM 1/2W 10%	83-1520-1319	1	
R14		0A781-7263	MINCOM SPEC	RES-FXC, FILM, 2K OHM, 1/2W, 2% S	83-1520-7263	1	
R16		0A781-7219	MINCOM SPEC	RES-FXC, FILM, 3K OHM, 1/2W, 2% S	83-1520-7219	1	

M64 PAR 2-71

M E G P A R T S L I S T

TITLE P.C. BD ASSY-LNE AMP,SIG FLECT		CATALOG NO. 83-4930-1091		PL 23059A060		REV J	
REF.DES./FIND #	---EFF--- REF. END.	DRAWING NUMBER - MEGR PART NO.	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.	
R18		0A781-7344	MINCOM SPEC	RES-FXD,FILM,120 OHM,1/2W,2% S	83-1520-7344	1	
R19,R20		0A781-7357	MINCOM SPEC	RES-FXD,FILM,750 OHM,1/2W,2% S	83-1520-7357	2	
R23		0A781-7329	MINCOM SPEC	RES-FXC,FILM,22 OHM,1/2W,2% S	83-1520-7329	1	
R24		LITTLE DEVIL	OHMITE	RES-FXD,COMP,2.7 OHM 1/2W 5%	83-9520-3258	1	
P25		0A781-7360	MINCOM SPEC	RES-FXD,FILM,2.2K OHM,1/2W,2% S	83-1520-7360	1	
S1,S2		TYPE G350-PC	CCNTL WIRT	SWITCH-SLIDE, DPDT,125V 3AMP	83-1550-5212	2	
TP1		3-582118-9	AMP INC	JACK-TIP,.156 WD X .460 DP	83-1610-0752	1	
000001		23059A061	H MINCOM	PC860-LINE AMPLIFIER	83-3640-0668	1	
000002		00000A667	B MINCOM	HANDLE-EJECTOR,P.C. BD,1.50 LG	83-3270-0371	1	
000003		79-022-094-0250	FSNA	PIN-SPRING, .094 DIA X .250 LG	83-7280-0270	1	
000004		00000A734-4	B MINCOM	LABEL-ICENT,P.C. BD,*6*	83-3550-1449	1	
000006		MS35206-215	MIL STD	SCREW-MACH,PAN HD,4-40 X 3/8	83-9260-4515	4	
000007				NUT-HEX,SM PATT,4-40 X .188 WD	83-9260-2201	4	
000008				WASHER-FLAT,.219 CD X .125 ID	83-9261-4012	4	
000009		MS35338-40	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#4	83-9261-4303	4	
000010		7717-2	THERMALLOY	PAD-TSTR, INLINE, 3 LEADS	83-9690-0191	3	

LAST OF 3 PAGES

M64 PAR 2-71

M E G P A R T S L I S T

TITLE	PC RD ASSY-DREFAMP,OVDR 7.5-15	CATALOG NO.	83-4930-2180	PL	230598090-1	REV	H
REF.DES./CIND #	-----	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER	QTY.
REF. END.	---	MEGR PART NO.					
C1,C6		TS04-20-226	COMP INC	CAP-FXD,TA,	22UF 20V 20%	83-1510-6203	2
C2		0A836-5096	MINCOM SPEC	CAP-FXD,MICA,	270PF 500V 5%	83-1510-5096	1
C3		TS05-20-686	COMP INC	CAP-FXD,TA,	68UF 20V 20%	83-1510-6211	1
C4		TS05-6-227	COMP INC	CAP-FXD,TA,	220UF 6V 20%	83-1510-6259	1
C5		E35P-103-10	MIDWEC	CAP-FXD,PLSTC,	.010UF 100V 5%	83-1510-4449	1
C7,C8		E35P-682-10	MIDWEC	CAP-FXD, PLS	.0068UF 100V 5%	83-1510-4447	2
C9,C10		TS05-35-156	COMP INC	CAP-FXD, TA,	15UF 35V 20%	83-1510-6209	2
C11		0A836-5120	MINCOM SPEC	CAP-FXD,MICA,	500PF 500V 5%	83-1510-5120	1
K1		701-3	ELEC-TROL	RELAY-SPST, 2K OHM 24VDC		83-1550-3620	1
K2		201-3	ELECTROL	RELAY-SPST, 2K OHM 24 V DC		83-1550-3621	1
L1		70F333AT	J.W. MILLER	CHOKEREF,3.3 MH 5 %		83-1540-0410	1
01,02		2N4384	SPRAGUE	TSTR-SI,NPN,	SW, 40 VCR	83-1530-2156	2
03,04,05		2N3391A	GENERAL ELEC	TSTR-SI,NPN,	PWP, 25 VCR	83-1530-2230	3
R1,P5		LITTLE DEVIL	OHMITE	RES-FXD,COMP,	1M OHM 1/2W 5%	83-9520-3220	2
R2		0A781-7344	MINCOM SPEC	RES-FXD,FILM,120 OHM,1/2W,2%	S	83-1520-7344	1
R3		0A781-7393	MINCOM	RES-FXD,FILM,270K OHM,1/2W,2%	S	83-1520-7393	1
R4		0A781-7350	MINCOM SPEC	RES-FXD,FILM,330 OHM,1/2W,2%	S	83-1520-7350	1
R6,P25		0A781-7373	MINCOM SPEC	RES-FXD,FILM,27K OHM,1/2W,2%	S	83-1520-7373	2
P7,R18,P21		0A781-7389	MINCOM SPEC	RES-FXD,FILM,180K OHM,1/2W,2%	S	83-1520-7389	3
P8		0A781-7174	MINCOM SPEC	RES-FXD,FILM,390 OHM,1/2W,2%	S	83-1520-7174	1
R9		0A781-7367	MINCOM SPEC	RES-FXD,FILM,6.8K OHM,1/2W,2%	S	83-1520-7367	1
P10		0A781-7375	MINCOM SPEC	RES-FXD,FILM,33K OHM,1/2W,2%	S	83-1520-7375	1
R11,P12,P13,P14,		0A781-7201	MINCOM SPEC	RES-FXD,FILM,1.8K OHM,1/2W,2%	S	83-1520-7201	5
R15							
P16		0A781-7147	MINCOM SPEC	RES-FXD,FILM,4.7K OHM,1/2W,2%	S	83-1520-7147	1
P17		0A818-1535	MINCOM SPEC	RES-VAR,CERMET,5K OHM, 1/2W	S	83-1520-1535	1
R19,P22	496	89DP1M	BECKMAN	RES-VAR,CFR,1M OHM 3/4 W 20%		83-1520-1567	2
R20,P23	497	89DP20K	BECKMAN	RES-VAR,CFR,20K OHM 3/4 W 20%		83-1520-1568	2

M64 PAR 2-71

M E C P A R T S L I S T

TITLE PC BD ASSY-PREAMP, OVERDR 7.5-15

CATALOG NO. 83-4930-2180

PI 230598090-1

REV H

REF. DES. / FIND #	---EEF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	REQ. END.	- MEGR PART NO.				
P24		0A781-7360	MINCOM SPEC	RES-FXD, FILM, 2.2K OHM, 1/2W, 2% S	83-1520-7360	1
P26		0A781-7218	MINCOM SPEC	RES-FXD, FILM, 680 OHM, 1/2W, 2% S	83-1520-7218	1
T1		TR-145 RV-35845	REYER XMER	XFMR-AUDIO FREQ, 15 K HZ, 80 OHM	83-1540-1284	1
000001		230598091	G MINCOM	PC2408-PREAMP, OVERDR	83-3640-1507	1
000002		00000A667	B MINCOM	HANDLE-EJECTOR, P.C. BD, 1.50 LG	83-3270-0371	1
000003		79-022-094-0250	FSNA	PIN-SPRING, .094 DIA X .250 LG	83-7280-0270	1
000004		7717-2	THERMALLOY	PAD-TSTR, INLINE, 3 LEADS	83-9690-0191	5
000005		00000A734-7	B MINCOM	LABEL-IDENT, P.C. BD, *7 9*	83-3550-1452	1
000008		A-10042-DAP	MILTON ROSS	PAD-TSTR, .250 DIA X .080 DP	83-9690-0104	2

LAST OF 3 PAGES

M64 PAR 2-71

M E G P A R T S L I S T

TITLE PC RD ASSY-PREFAMP, OVERDRIVE 15/30 CATALOG NO. 83-4930-2511 PL 230598090-2 REV H
 REF. DES. / FIND # ---FFF--- DRAWING NUMBER MEGR NAME DESCRIPTION PH CATALOG NUMBER QTY.
 BEG. END. - MEGR PART NO.

SAME AS 230598090-1 EXCEPT AS NOTED BELOW

R11, R12, R15	0A781-7201	MINCOM SPEC	RES-FXD, FILM, 1.8K OHM, 1/2W, 2% S	83-1520-7201	3
R13, R14	0A781-7264	MINCOM SPEC	RES-FXD, FILM, 910 OHM, 1/2W, 2% S	83-1520-7264	2

M F G P A R T S L I S T

TITLE P.C. BD ASSY-EXTENDER		CATALOG NO. 83-4930-1746		PL 23059A110		REV A	
REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.	
		BEG. END. - MFGR PART NO.					
000001		23059A111	B MINCOM	P.C. BD-EXTENDER	83-3640-1139	1	
000002		2VK22S/1-2	VIKING	CONN-P.C., ELFC, PIERCD, 22 CON	83-1610-0845	1	
000003		MS35206-217	MIL STD	SCREW-MACH, PAN HD, 4-40 X 1/2	83-9260-4517	2	
000004				WASHER-FLAT, .219 OD X .125 ID	83-9261-4012	2	
000005		MS35338-40	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #4	82-9261-4307	2	
000006		1434	BIRNBACH	WIRE-BUS, 22GA ROUND	83-7910-0105	AP	
000007		TFT-200/22	ALPHA WIRE	TUBING-TEFLON, #22, .027 ID, NAT	83-7910-0388	AR	

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE MOTOR ASSY-7 1/2-15, 60 HZ

CATALOG NO. 93-4560-0225

PL 56007A060-1

REV F

REF.DES./FIND # ---EFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
BEG. END. - MFGR PART NO.

C64		200P1450	SPRAGUE	CAP-FXD, PLSTC, 2.UF 440V 10%	83-1510-4433	1
P8		1-490324-0	AMP INC	SHELL-CAN, RECT, 15POSITION	83-1610-0933	1
000001		56007AC40-1	A MINCOM	MOTOR-CAPSTAN, 7 1/2-15 IPS, 60C	93-3560-0220	1
000002	354	56007B061	A MINCOM	BRACKET-CAPSTAN MOTOR MTG	83-3320-2426	1
000003		3-36-150E	SPRAGUE	BRACKET-CAPACITOR MTG, .750 WD	83-1320-1116	2
000004		MS16998-28	MIL STD	SCREW-CAP, SOC HD, 10-32 X 5/8	83-9261-2102	4
000005		60618-4	AMP INC	CONTACT-ELEC, PIN, .084 DIA	83-1610-0925	12
000006		56007AC42	A MINCOM	SHIELD-CAPSTAN MOTOR	83-3650-0600	1
000007		MS27193-8	MIL STD	WASHER-FLAT, GENERAL PURPOSE, #10	83-9261-4006	4
000008		MS35338-43	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #10	83-9261-4307	4
000009		MIL-W-16978	NATL WIRE	WIRE-TYPE B, 22GA WHT NYLON JKT	83-7910-0043	AR

LAST OF 2 PAGES

MFG PARTS LIST

TITLE MOTOR ASSY-7 1/2-15, 50 HZ

CATALOG NO. 83-4560-0227

PL 56007A060-2

REV F

REF.DES./FIND # ---EFF--- DRAWING NUMBER MFGR NAME DESCRIPTION PH CATALOG NUMBER QTY.
BEG. END. - MFGR PART NO.

C64		200P1450	SPRAGUE	CAP-FXD, PLSTC, 2.UF 440V 10%	83-1510-4433	1
P8		1-480324-0	AMP INC	SHELL-CCNN, RECT, 15POSITION	83-1610-0933	1
000001		56007A040-3	A MINCOM	MOTOR-CAPSTAN, 7 1/2-15 IPS, 50C	83-3560-0222	1
000002	354	56C078C61	A MINCOM	BRACKET-CAPSTAN MOTOR MTG	83-3320-2426	1
000003		3-36-150E	SPRAGUE	BRACKET-CAPACITOR MTG, .750 WD	83-1320-1116	2
000004		MS16998-28	MIL STD	SCREW-CAP, SOC TD, 10-32 X 5/8	83-9261-2102	4
000005		60618-4	AMP INC	CONTACT-ELEC, PIN, .084 DIA	83-1610-0925	12
000006		56007A042	A MINCOM	SHIELD-CAPSTAN MOTOR	83-3650-0600	1
000007		MS27183-8	MIL STD	WASHER-FLAT, GENERAL PURPSE, #10	83-9261-4006	4
000008		MS35338-43	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #10	83-9261-4307	4
000009		MIL-W-16878	NATL WIRE	WIRE-TYPE B, 22GA WHT NYLON JKT	83-7910-0043	AR

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE MOTOR ASSY-CAP,15-30IPS,60 HZ

CATALOG NO. 83-4560-0283

PL 56007B065-1

REV B

REF.DES./FIND #	---EFF--- BEG. END.	DRAWING NUMBER - MFGR PART NO.	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
-----------------	------------------------	-----------------------------------	-----------	-----------------------	-------------------	------

C64	413	200P1450	SPRAGUE	CAP-FXD,PLSTC, 2.UF 440V 10%	83-1510-4433	1
P8	413	1-480324-0	AMP INC	SHELL-CCNN,RECT, 15POSITION	83-1610-0933	1
000001	413	56007AC40-2	A MINCOM	MOTOR-CAPSTAN,15-30 IPS,60 CY	83-3560-0221	1
000002	413	56007B061	A MINCOM	BRACKET-CAPSTAN MOTOR MTG	83-3320-2426	1
000003	413	3-36-150E	SPRAGUE	BRACKET-CAPACITOR MTG,.750 WD	83-1320-1116	2
000004	413	MS16998-28	MIL STD	SCREW-CAP,SOE HD,10-32 X 5/8	83-9261-2102	4
000005	413	60618-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA	83-1610-0925	12
000006	413	56007BC42	A MINCOM	SHIELD-CAPSTAN MOTOR,MUMETAL	83-3650-0661	1
000007	413	MS27183-8	MIL STD	WASHER-FLAT,GENERAL PURPSE,#10	83-9261-4006	4
000008	413	MS35338-43	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#10	83-9261-4307	4
000009	413	MIL-W-16878	NATL WIRE	WIRE-TYPE B,22GA WHT NYLON JKT	83-7910-0043	AR

LAST OF 2 PAGES

M E G P A R T S L I S T

TITLE		MOTOR ASSY-CAP,15-30 IPS,50 HZ		CATALOG NO.	83-456C-0284	PL	560078065-2	REV	B
REF.DES./FIND #	---	FFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N .	PH CATALOG	NUMBER	QTY.	
		PEG.	END.	- MEGR PART NO.					
C64		413	0V3020	SPRAGUE	CAP-FXD, 3 UF, 330 VAC	83-1510-4571		1	
P8		413	1-480324-0	AMP INC	SHELL-CCAN,RECT, 15POSITION	83-1610-0933		1	
000001		413	56007A040-4	A MINCOM	MOTOR-CAPSTAN,15-30 IPS, 50 CY	83-3560-0223		1	
000002		413	560078061	A MINCOM	BRACKET-CAPSTAN MOTOR MTG	83-3320-2426		1	
000003		413	3-36-150E	SPRAGUE	BRACKET-CAPACITOR MTG,.750 WD	83-1320-1116		2	
000004		413	MS16998-28	MIL STD	SCREW-CAP,SOC FD,10-32 X 5/8	83-9261-2102		4	
000005		413	60618-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA	83-1610-0925		12	
000006		413	560078042	A MINCOM	SHIELD-CAPSTAN MOTOR,MUMETAL	83-3650-0661		1	
000007		413	MS27183-8	MIL STD	WASHER-FLAT,GENERAL PURPSF,#10	83-9261-4006		4	
000008		413	MS3533P-43	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#10	83-9261-4307		4	
000009		413	MIL-W-16878	NATL WIRE	WIRE-TYPE B,22GA WHT NYLON JKT	83-7910-0043		AR	

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/2 IN, 4 TRK, 7.5-15, 60 HZ

CATALOG NO. 83-5996-4000

PL 64000A001

REV B

REF. DES. / FIND # ---EFF--- DRAWING NUMBER MFG NAME DESCRIPTION PH CATALOG NUMBER QTY.
 REF. END. - MFG PART NO.

DS1, DS2, DS3, DS4, DS5, DS6 DS8	519 519	327 1820	GENERAL ELFC GF	LAMP-INCANDESCENT, .04 AMP LAMP-INCANDESCENT, 28 V, .10 A	83-1550-2506 83-1550-2602	6 1
L1, L2 L4 L5	519 519 519	42C24CC-AX 128264-001 42C24CC-AU	PHILLIPS CON LEDEX PHILLIPS CON	SOLENOID-ELECTRICAL, PUSH/PULL SOLENOID-POTARY SOLENOID-ELECTRICAL, PUSH/PULL	83-1550-4516 83-1550-4514 83-1550-4513	2 1 1
P2	519	23013A085	A MINCOM	CONN-PLUG, SHORTING, TAPE TRANS	83-4610-1136	1
000001	519	23013AC90-1	B MINCOM	ARM ASSY-IDLER, ROLLER, LH	83-4210-0230	1
000002	519	23013A090-2	B MINCOM	ARM ASSY-IDLER, ROLLER, RH	83-4210-0231	1
000003	519	23007AC50-1	K MINCOM	ARM ASSY-IDLER, ACTUATING, RH	83-4210-0232	1
000004	519	23013A095	B MINCOM	ARM ASSY-ACTUATOR, DOOR HD CVR	83-4210-0237	1
000005	519	23007A050-2	K MINCOM	ARM ASSY-IDLER, ACTUATING, LH	83-4210-0256	1
000006	519	23007A040-1	D MINCOM	ROLLER ASSY-IDLER, 1/2 IN INCOM	83-4240-0310	1
000007	519	23007A040-2	D MINCOM	ROLLER ASSY-IDLER, 1/2 IN OTGNG	83-4240-0311	1
000008	519	23007A020-1	K MINCOM	IDLER ASSY-REVERSING, 1/2 INCH	83-4240-0318	1
000009	519	23007AC30-1	D MINCOM	DOOR ASSY-HEAD COVER, TPE TRANS	83-4330-0241	1
000010	519	23004A050	B MINCOM	MOTOR ASSY-REWIND, REEL	83-4560-0092	1
000011	519	64007A060-1	A MINCOM	MOT ASSY-CPSN, 7 1/2-15 IPS, 60HZ	83-4560-0299	1
000013	519	23004B000	B MINCOM	MOTOR ASSY-TAKE UP REEL	83-4560-0237	1
000014	519	64013AC60	A MINCOM	PCB ASSY-LOGIC TRANSPORT	83-4930-3065	1
000015	519	23007AC6C-1	G MINCOM	CAPSTAN ASSY-TAPE TRANS, 1/2 IN	83-5920-0819	1
000016	519	64013AC85	B MINCOM	CHASSIS ASSY-TRANSPRT ELFC, 1/2	83-5920-1857	1
000017	519	23013AC46	C MINCOM	ARM-DAMPENING, IDLER	83-3210-0223	1
000018	519	23013AC67	B MINCOM	ARM-ACTUATOR, TAPELIFTER	83-3210-0253	1
000019	519	56007A001	C MINCOM	FLYWHEEL-CAPSTAN DRIVE	83-3220-0293	1
000020	519	23013AC74	B MINCOM	BUMPER-FUR SLV, .06 ID X .310LG	83-3230-0390	2
000021	519	23013A073	A MINCOM	SPACER-MACHINFD, DAMPENER, TEF	83-3230-0391	1
000022	519	23013A077-1	MINCOM	SHIM-TAPE GUIDE, .002 THK	83-3230-0401	AR
000023	519	23013AC77-2	MINCOM	SHIM-TAPE GUIDE, .005 THK	83-3230-0402	AR

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,7.5-15,60 HZ

CATALOG NO. 83-5996-4000

PL 64000ACC1

REV B

REF.DES./FIND #	---EFF--- BEG. END.	DRAWING NUMBER - MFG PART NO.	MFG NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
000024	519	23013AC77-3	MINCOM	SHIM-TAPE GUIDE, .010 THK	83-3230-0403	AR
000025	519	23013AC77-4	MINCOM	SHIM-TAPE GUIDE, .020 THK	83-3230-0404	AR
000026	519	23013A192	A MINCOM	COLLAR-SPLINE, REEL HUB	83-3230-0440	2
000027	519	23013B013-2	A MINCOM	TAPE GUIDE-INCOMING, 1/2 IN	83-3240-0627	2
000028	519	23013B014-2	A MINCOM	TAPE GUIDE-OUTGOING, 1/2 IN	83-3240-0633	2
000029	519	23013A193	B MINCOM	BASE-REEL, HUB, SPINDLE	83-3240-0494	2
000030	519	19007A022	D MINCOM	CAP-FLYWHEEL, PRECISION PLATE	83-3250-0082	1
000031	519	230C7A023-2	C MINCOM	CAP-DECORATIVE	83-3250-0108	1
000032	519	23013B035	A MINCOM	SHAFT-ARM, IDLER	83-3280-0889	2
000033	519	23013A044	A MINCOM	SPRING-RETURN, IDLER ARM, CAPSTN	83-3280-0422	3
000034	519	23013C036		SHAFT-MTG, TAPE LIFTER	83-3280-0890	1
000035	519	23007AC54	A MINCOM	SPRING-SHOCK ABSORBING-IDLER	83-3280-0542	1
000036	519	23013B191	A MINCOM	SHAFT-SPINDLE, REEL HUB	83-3280-0861	2
000037	519	23013A020	A MINCOM	COVER-SWITCH, TAPE METERING	83-3310-0838	1
000038	519	23000A005-1	D MINCOM	COVER-TAPE DECK	83-3310-0995	1
000039	519	56007A055	C MINCOM	COVER-DUST, BELT DRIVE, TOP	83-3310-1437	1
000040	519	560C7B056	A MINCOM	COVER-DUST BELT DR, BOTTOM	83-3310-1649	1
000041	519	23007B003-1	A MINCOM	COVER-IDLER, SNAP-ON	83-3310-1572	1
000042	519	23007B003-2	A MINCOM	COVER-IDLER, SNAP-ON	83-3310-1573	1
000043	519	23013B015	A MINCOM	COVER-CAPSTAN, RH, DECORATIVE	83-3310-1576	1
000044	519	23013B032	A MINCOM	COVER-CAPSTAN, LH, DECORATIVE	83-3310-1577	1
000045	519	56CC7B005	A MINCOM	COVER-HEAD, TRIM	83-3310-1582	1
000046	519	56013B001	B MINCOM	COVER-LAMP, DECORATIVE	83-3310-1583	1
000047	519	23013A002	R MINCOM	PLATE-TAPE DECK, TRANSPORT	83-3320-1027	1
000048	519	23013A028	D MINCOM	BRACKET-MTG, SOLENOID, TPE TRANS	83-3320-1107	1
000049	519	23013A011	E MINCOM	BRACKET-MTG, SOLENOID, RH	83-3320-1108	1
000050	519	23013A047	A MINCOM	BRACKET-SOLENOID MTG, TAPE LIFT	83-3320-1167	1
000051	519	23013A021-2	C MINCOM	PLATE-MASKING, SWITCH, POWER	83-3320-1424	1
000052	519	23013A022-2	D MINCOM	PLATE-MASKING, SWITCH, CONTROL	83-3320-1425	1
000053	519	23013A173	B MINCOM	BRACKET-SUPPORT, PHOTO CELL	83-3320-1714	1
000054	519	23013A018-3	E MINCOM	TRIM-SWITCH PANEL	83-3330-0316	1
000055	519	23013A018-4	F MINCOM	TRIM-SWITCH PANEL, RH	83-3330-0317	1
000056	519	23013A025	A MINCOM	SUPPORT-DASHPOT, DECOR, HEAD COVER	83-3340-0382	1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,7.5-15,60 HZ

CATALOG NO. 83-5996-4000

PL 640COAC01

REV B

REF.DES./FIND #	---FFF--- BFG. ENC.	DRAWING NUMBER - MFGR PART NO.	MFGR NAME	D E S C R I P T I O N	PL CATALOG NUMBER	QTY.
000057	519	23013AC45	A MINCOM	SPACER-FWR SUP MTG,1.430 LG	83-3350-0412	1
000058	519	23013A055	A MINCOM	SPACER-COVER PLATE,TRANSPORT	83-3350-0414	2
000059	519	56CC7AC50	A MINCOM	BELT-DRIVE	83-3390-0047	1
000060	519	160498015-1	A MINCOM	LENS-INC LIGHT, *REWIND*	83-3550-1982	1
000061	519	160498015-2	A MINCOM	LENS-INC LIGHT, *FORWARD*	83-3550-1983	1
000062	519	23013AC05	C MINCOM	LENS-LAMP,TAPE SENSOR	83-3550-1406	2
000063	519	230138027	A MINCOM	LENS-LIGHTED SW,PR, POWER	83-3550-1980	1
000064	519	230138038	A MINCOM	LENS-INC LIGHT, *STOP*	83-3550-1981	1
000065	519	160498015-3	A MINCOM	LENS-INC LIGHT, *RECORD*	83-3550-1984	1
000066	519	160498015-4	A MINCOM	LENS-INC LIGHT, *PLAY*	83-3550-1985	1
000067	519	00000A741-3	E MINCOM	LABEL-IDENT,PATENT, MOD 23	83-3550-1500	1
000068	519	00000A769	C MINCOM	LABEL-IDENTIFICATION,MODULE	83-3550-1621	1
000070	519	AMF5DD-FS160	FAFNIR	BRG-BALL,ANLR,FLNCD,.3125 BORE	83-1230-0178	6
000071	519	303-85-15-1000	ELEC REGULTR	DASHPOT-AIR DAMPING CYLINDER	83-1270-0490	1
000072	519	303-85-15-1.25	ELEC REGULTR	DASHPOT-AIR DAMPING CYLINDER	83-1270-0491	1
000073	519	A-4030145-10	AMPEX	KNOB ASSY-EDITING, AUDIO TAPE	83-1270-0679	2
000074	519	A35	GENERAL ELEC	PHOTOELECTRIC CELL-LT ACTIVATE	83-1530-6020	1
000075	519	185-1873	DIALCO	LENS-CAP ASSY,1/2 IN SQ,AMBER	83-1550-5243	1
000076	519	185-1872	DIALCO	LENS-CAP ASSY,1/2 IN SQ,GREEN	83-1550-5244	1
000077	519	17460S	BELDON	CABLE ASSY-PWR,ELEC, 10 FT LG	83-1570-0303	1
000078	519	TRUARC	MIL STD	RING-RETAINING,EXT,.225 I.D.	83-7270-0118	1
000079	519	MS16633-1025	MIL STD	RING-RETAINING,TYPE E,1/4 IC	83-7270-0413	3
000080	519	5555-12	TRUARC	RING-RETNG, EXT, .120 ID	83-7270-0503	3
000081	519	GP67-125X500-12	GROOV-PIN	PIN-GRVC,HOLS,.125 DIA X.500LG	83-7280-0207	3
000082	519	21-S-C94-C437	STD PRSD STL	PIN-SPRING,.094 DIA X.437LG	83-7280-0223	2
000083	519	GP4-125X0500-12	GROOV-PIN	PIN-GRND,HOLS,.125 DIA X.500LG	83-7280-0484	3
000084	519	#775	H.H. SMITH	CLAMP-CABLE,NYLCN,.479 DIA	83-7650-0058	1
000085	519	23007AC44-1	A MINCOM	SHIM-IDLER,TAPE DRIVE,.002 THK	83-3230-0362	AR
000086	519	23007AC44-2	A MINCOM	SHIM-IDLER,TAPE DRIVE,.005 THK	83-3230-0363	AR
000087	519	23007AC44-3	A MINCOM	SHIM-IDLER,TAPE DRIVE,.010 THK	83-3230-0364	AR
000088	519	23007AC44-4	A MINCOM	SHIM-IDLER,TAPE DRIVE,.020 THK	83-3230-0365	AR
000089	519	56CC7AC12	A MINCOM	SCREW-REV IDLER,1/4-20 X 1.875	83-3260-0196	1
000090	519	23013AC64-1	C MINCOM	SCREW-MTG, TAPE GUIDE	83-3262-0537	4

M64 PAR 2-71

MFG PARTS LIST

TITLE ASSY-1/2 IN,4 TRK,7.5-15,60 HZ

CATALOG NO. 83-5996-4000

PL 64000A001

REV B

REF.DES./FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
BEG. END.		- MFGR PART NO.				
000091	519		NYLOCK	SCREW-MACH,FH,100% 10-32 X 5/8	83-9260-0029	1
000092	519	F12NTEC-524	KAYNAR	NUT-SELF LKG, HEX, 5/16-24	83-9260-0186	3
000093	519	MS35206-237	MIL STD	SCREW-MACH,PAN HD,6-32 X 1.750	83-9260-4544	1
000094	519	MS35206-261	MIL STD	SCR-MACH,PAN HD,10-24 X 3/8 LG	83-9260-4588	2
000095	519	MS35190-223	MIL STD	SCREW-MACH,FH,4-40 X 3/8	83-9260-6504	2
000096	1521	MS35190-240	MIL STD	SCREW-MACH,FH,6-32 X 3/4	83-9260-6522	2
000097	1521	MS51017-26	MIL STD	SETSCREW-CUP PT,6-32 X 1/2	83-9261-0051	2
000098	519			SCREW-STC, 8-32X1/4	83-9261-2057	4
000099	519	MS16598-29	MIL STD	SCREW-CAP,SOC HD,10-32 X 3/4	83-9261-2103	2
000100	519	MS16598-31	MIL STD	SCREW-STC, 10-32X1	83-9261-2105	3
000106	519	MS35338-40	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#4	83-9261-4303	AR
000107	519	MS35338-41	MIL STD	WASHER-LOCK,SPLIT,#6	83-9261-4305	AR
000108	519	MS35338-42	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#8	83-9261-4306	4
000109	519	MS35338-43	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#10	83-9261-4307	AR
000110	519	MS35338-44	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#1/4	83-9261-4309	1
000111	519		MIL STD	SCREW-MACH,OVAL HD,6-32 X 7/8	83-9261-4340	2
000112	519	AN960-416L	A & N STD	WASHER-FLAT,LIGHT SERIES,#1/4	83-9262-0046	5
000113	519			SCR-CAP,FH,1/4X20X5/8,NYLON	83-9262-0569	1
000114	519	1126	BIRNBACH	SPACER-RD,#6 SCREW SIZE,.375LG	83-9350-0099	2
000115	519	6593	BIRNBACH	INSULATOR-WASH, NYLON,.016 TK	83-9630-0272	AR
000116	519	23028AC50	B MINCOM	CABLE ASSY-PWR,4TRK,36 IN	83-4570-0346	1
000117	519	23000A010-4	MINCOM	CABLE ASSY-INTERCONN,HDS,4 TRK	83-4570-0385	1
000118	519	64028AC40	A MINCOM	CABLE ASSY-STPCN XFMR,4 TRACK	83-4570-0803	1
000119	519	64028A020-1	B MINCOM	CABLE ASSY-METER DISPLAY,4 TRK	83-4570-0805	1
000120	519	23059A060	J MINCOM	P.C. BD ASSY-LNE AMP,SIG ELECT	83-4930-1091	4
000121	519	23059B030	A MINCOM	PC BD ASSY-CONVERSION,NAB,REC	83-4930-2961	4
000122	519	23059B040	G MINCOM	P.C. BD ASSY-RECORD,NAB	83-4930-1214	4
000123	519	23059A110	A MINCOM	P.C. BD ASSY-EXTENDER	83-4930-1746	1
000124	519	23059B090-1	H MINCOM	PC BD ASSY-PREAMP,OVDOUB 7.5-15	83-4930-2180	4
000125	519	23059B020	C MINCOM	PC BD ASSY-BIAS ERASE	83-4930-2952	4
000126	519	64059AC10	C MINCOM	HSG ASSY-SIG ELECT,REC/REP	83-4930-2980	4
000127	519	64021A000-1	A MINCOM	PWR SUP ASSY-ELECT,4 TRACKS	83-5920-1821	4
000128	519	23000B020-4	E MINCOM	HD SET ASSY-REC/REP/FRASE,4 TK	83-5950-1230	1

M64 PAR 2-71

MFG PARTS LIST

TITLE ASSY-1/2 IN,4 TRK,7.5-15,60 HZ			CATALOG NO.	83-5996-4000	PL 64000A001	RFV B
REF. DES./FIND~#	---EFF---	DRAWING NUMBER	MFGR NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.
	BEG. END.	- MFGR PART NO.				
000129	519	1120	SLIDE CO	PULLEY-CROOVE,NY,1.00 ODX3/8WD	83-1220-0331	4
000130	519	#10	CALIF HDW	COUNTERBALANCE-WDC SASH, DUAL	83-1240-0648	2
000131	519		ALLMETAL	PIN-DOWEL .250 X 1.250	83-1280-0225	2
000132	519	23028AC10	A MINCOM	HINGE-PIVOT, CABINET, CONSOLE	83-3270-0560	2
000133	519	23000AC03	A MINCOM	BAR-HINCE MTG, TRANSPORT	83-3290-0164	1
000134	519	23028A039	MINCOM	HOUSING DISPLAY,METER,MOD 23	83-3310-0993	1
000135	519	23028AC02	A MINCOM	BRKT-MTG, CABINET	83-3320-1415	2
000136	519	23028A043	MINCOM	BRKT-SUP, CABINET	83-3320-1420	1
000137	519	23000A001	C MINCOM	BRKT-MTG, TRANSPORT	83-3320-1421	4
000138	519	23000AC04-1	A MINCOM	PLATE-MTG,SIDE, LH, TRANSPORT	83-3320-1422	1
000139	519	23000A004-2	A MINCOM	PLATE-MTG,SIDE, RH, TRANSPORT	83-3320-1423	1
000140	519	56028A914-1	A MINCOM	BRACKET-LIFTER,TRANSPORT,LH	83-3320-2342	1
000141	519	56028A914-2	A MINCOM	BRACKET-LIFTER, TRANSPORT,RH	83-3320-2343	1
000142	519	23028A033-3	A MINCOM	BRACKET-MTG, SIG ELECTRONICS	83-3320-2373	1
000143	519	23028A033-4	A MINCOM	BRACKET-MTG, SIG ELECTRONICS	83-3320-2374	1
000144	1521	23028A001	A MINCOM	TRIM-BAR, CABINET	83-3330-0314	1
000145	519	23000AC02	C MINCOM	TRIM-ANGULAR, TRANSPORT	83-3330-0315	1
000146	519	0000CA759	MINCOM	PLATE NAME UNIVERSAL	83-3330-0336	1
000147	519	23028A005	C MINCOM	SUPPORT-TRANSPORT, CABINET	83-3340-0500	1
000148	519	23028AC42	A MINCOM	SUPPORT-CHANNEL, TRANSPORT	83-3340-0506	1
000149	519	56028A007-1	A MINCOM	SUPPORT-UPPER, LEFT	83-3340-0693	1
000150	519	56028A007-2	A MINCOM	SUPPORT-UPPER, RIGHT	83-3340-0694	1
000151	519	56028A913	A MINCOM	SUPPORT-CABLE,TRANSPORT LIFTER	83-3340-0733	1
000152	519	18059A014	C MINCOM	SPACER-PANEL,SIGNAL ELECT	83-3350-0314	2
000153	519	23028AC44	A MINCOM	SPACER-FLATE, TRANSPORT SUP	83-3350-0474	2
000154	519	23028A023-2	A MINCOM	STOP-BAR,DOOR,CABINET CONSOLE	83-3350-0722	1
000155	519	23028A015-2	A MINCOM	PANEL-FILLER, CONSOLE	83-3360-1428	1
000156	519	56028AC38	A MINCOM	PANEL-FILLER, HOUSING	83-3360-1423	1
000157	519	23028AC40-2	A MINCOM	PANFL-HOUSING, METER DISPLAY	83-3360-1664	1
000158	519	00000A627-10	S MINCOM	LABEL-I.D.,M-23,PROFFESION REC	83-3550-1482	1
000159	519	23059BC52	A MINCOM	METER-MICROVOLT,ILLUM DIAL	83-3550-3152	4
000160	519	23028D035	A MINCOM	CABINET-FNCLOSURE,CSL,BLANK	83-3310-1681	1
000161	519	A6732-5-3	ESNA	NUT-NON LKG,PL,10-32	83-9260-0059	16

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,7.5-15,60 HZ

CATALOG NO. 83-5996-4000

PL 64C00A001

REV B

REF.DES./FIND # ---EFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
 BFG. END. - MFGR PART NO.

000162	519	MS35216-27	MIL STD	SCREW-MACH,PAN HD,6-32 X 1/2LG	83-9260-0156	4
000163	519	NAS1352-04-8	NAS STD	SCREW-CAP,SCC HD,4-40 X 1/2	83-9261-2003	2
000164	519	23007A018-1	A MINCOM	SHIM-CAPSTAN HOUSING,.002 THK	83-3230-0479	AR
000165	519	23007A018-2	A MINCOM	SHIM-CAPSTAN HOUSING,.003 THK	83-3230-0480	AR
000166	519	MS35190-234	MIL STD	SCREW-MACH,FH,6-32 X .250	83-9260-6515	2
000167	519	MS35190-236	MIL STD	SCREW-MACH,FH,6-32 X 3/8	83-9260-6517	2
000168	519	MS35207-268	MIL STD	SCREW-MACH,PAN HD,10-32X 1 1/4	83-9260-4579	4
000169	519	AN505-8R9	A & N STD	SCREW-MACH,FH,8-32 X 9/16	83-9260-6533	8
000171	519	MS35191-279	MIL STD	SCREW-MACH,FLAT HD,10-32 X 1.75	83-9260-6567	12
000172	519	NAS620-416	NAS STD	WASHER-FLAT,SM PATT,#1/4	83-9261-4043	4
000173	519	23028A049	A MINCOM	SPACER-TRANSFORMER, CONSOLE	83-3350-0711	2
000174	519			SCREW-WCCD, RD HD,#10 X 1.00LG	83-9262-0559	8
000175	519			SCREW-WCCD, RD HD,#6 X 7/8	83-9262-0555	4
000176	519			SCREW-WCCD, RND HD #8 X 7/8	83-9262-0556	7
000177	519			SCREW-WCCD, RND HD #10 X 7/8	83-9262-0558	8
000178	520	MS35495-127	MIL STD	SCREW-WCCD,RND HD,SLT,#14X1.25	83-9260-0227	4
000180	519	23013A040-1	D MINCOM	ARM ASSY-TAPE LIFTER,TRANSPORT	83-4210-0206	1
000181	519	GP7-125X1000-12	GROOV-PIN	PIN-GRVD,HDLS,.125 X 1.000 LG	83-7280-0212	1
000182	519	21FK-1032	STD PRSD STL	NUT-SELF-LOCKING,10-32 X 3/8	83-9260-2408	1

LAST OF 7 PAGES

163/164

M64 PAR 2-71

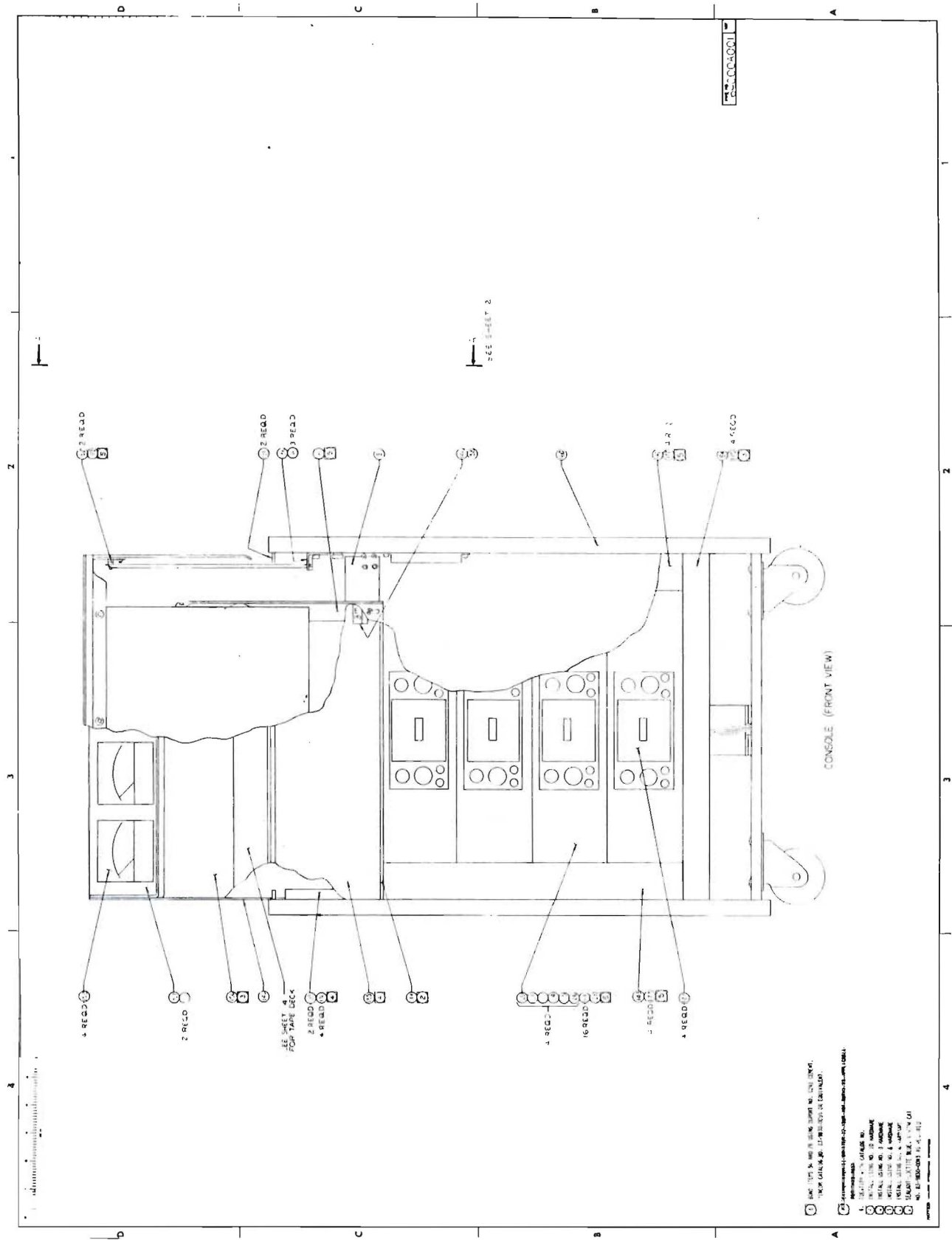


Figure 36. Tape Deck Assembly (Sheet 1 of 5)

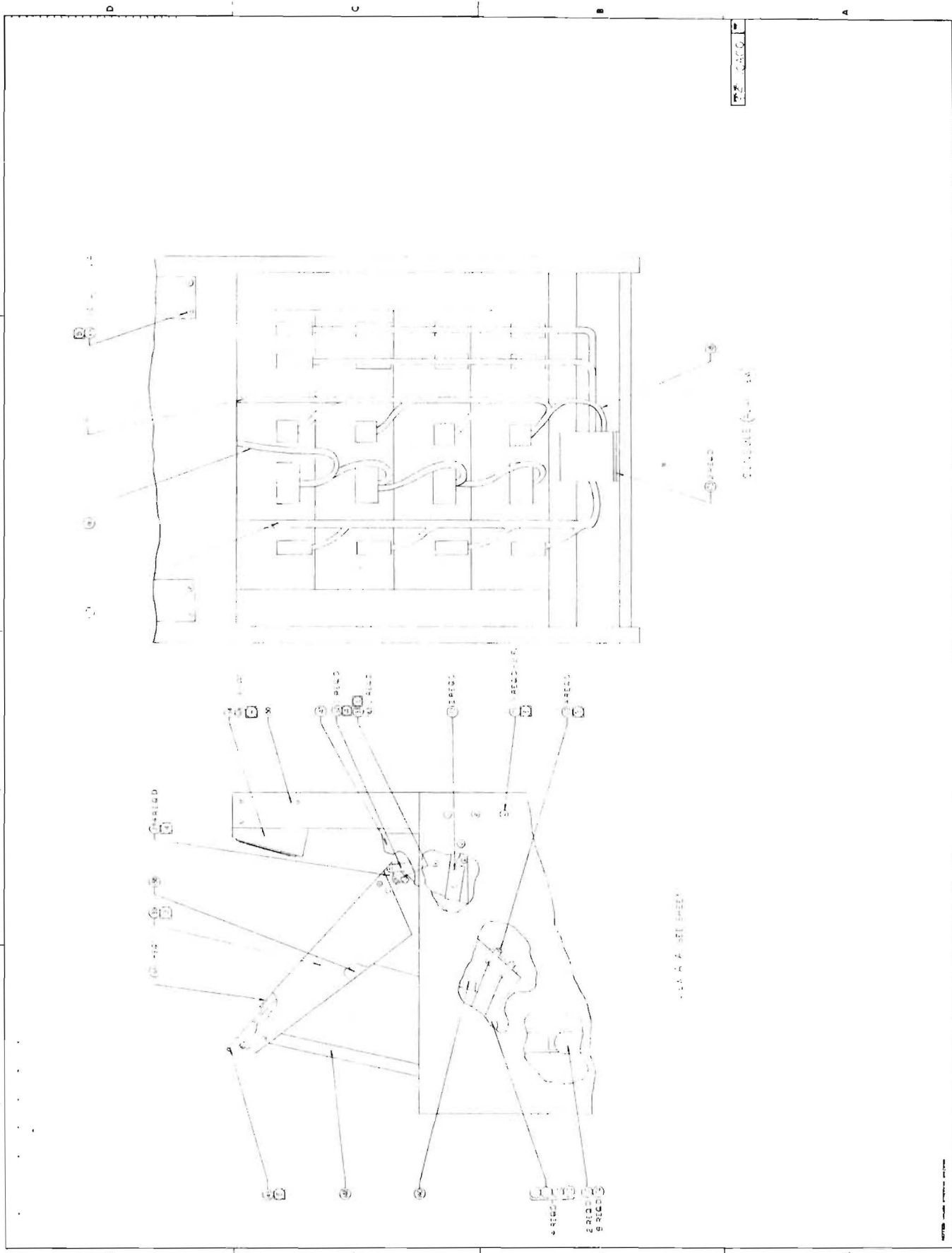


Figure 36. Tape Deck Assembly (Sheet 2 of 5)

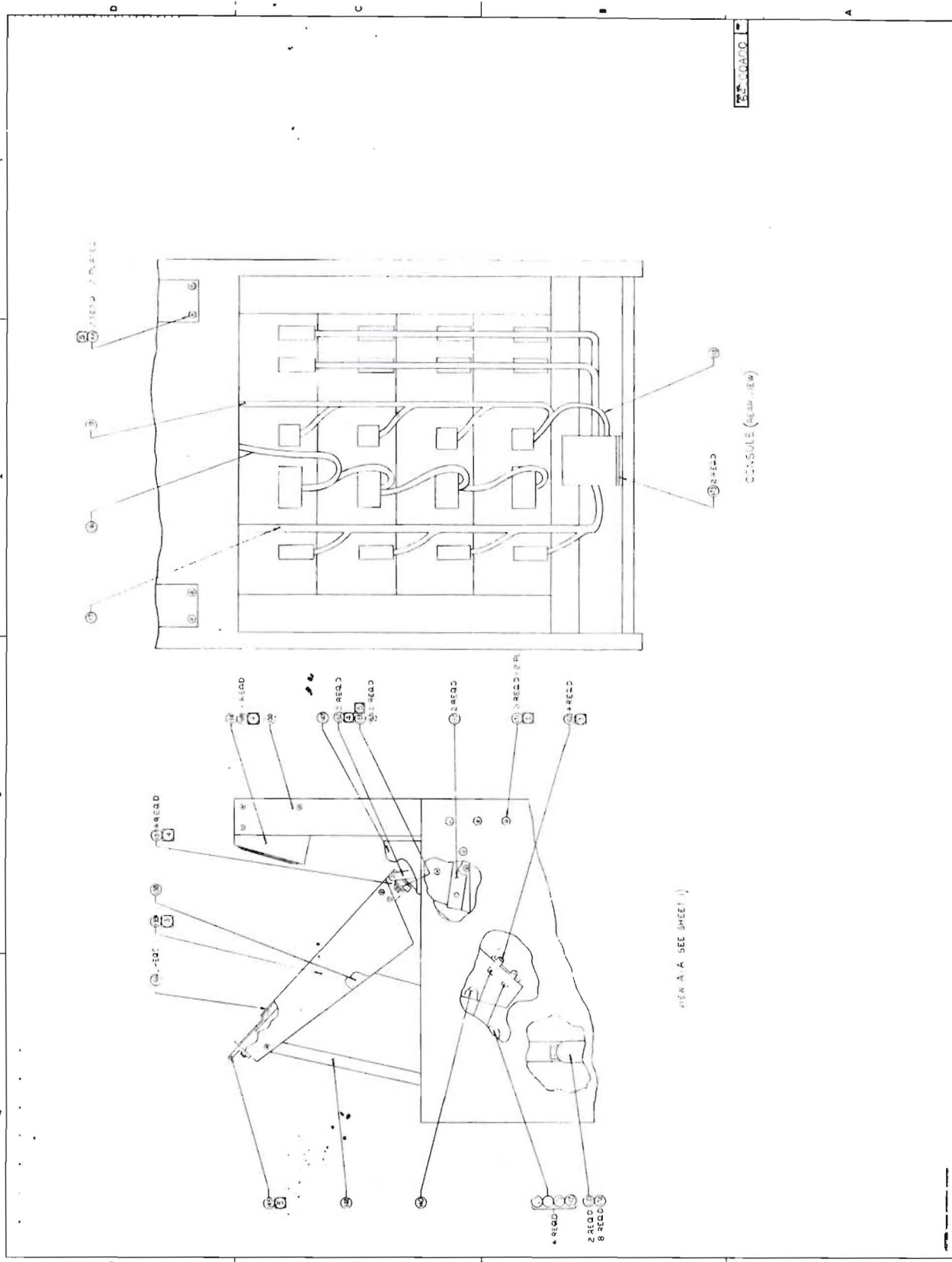


Figure 36. Tape Deck Assembly (Sheet 2 of 5)

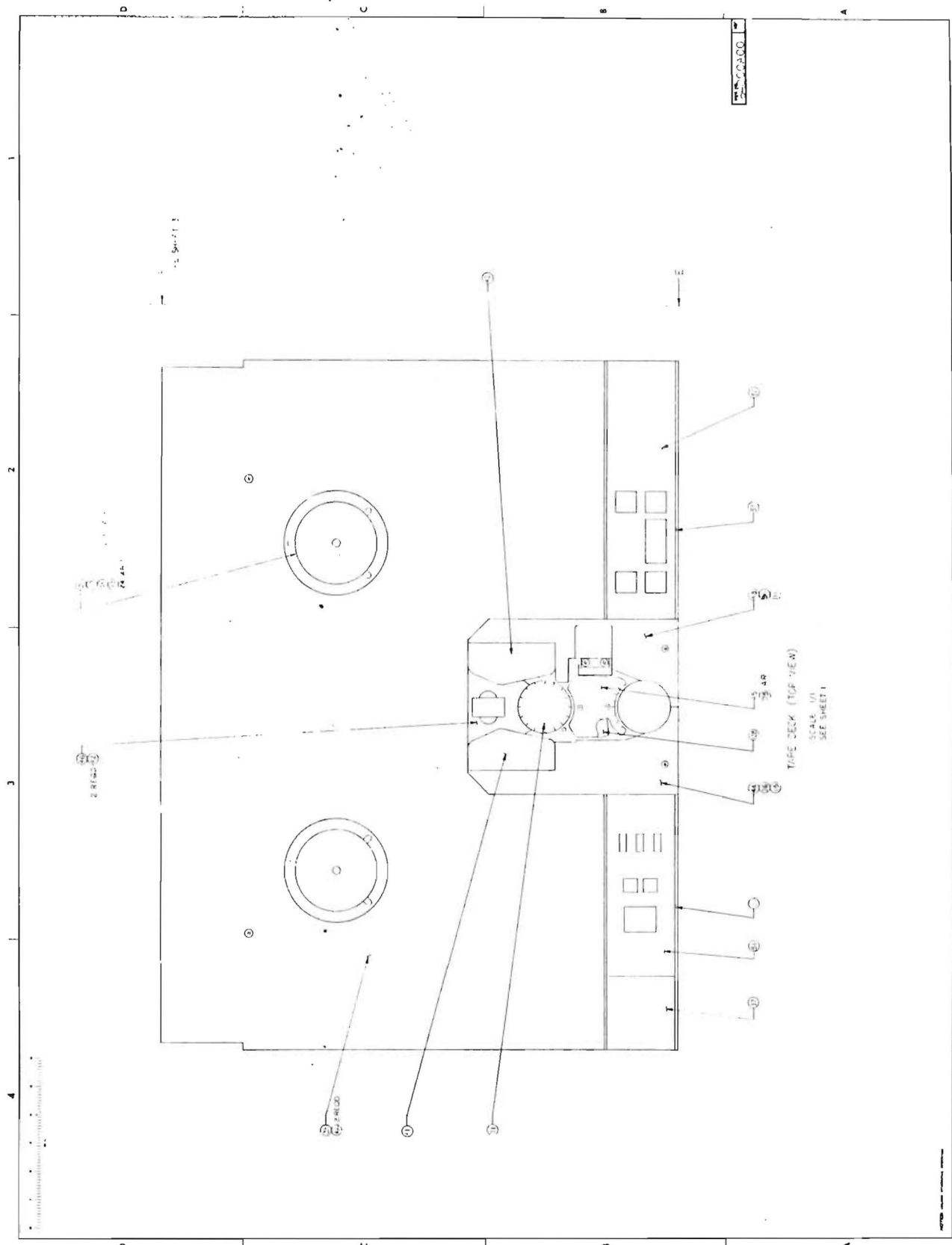


Figure 36. Tape Deck Assembly (Sheet 4 of 5)

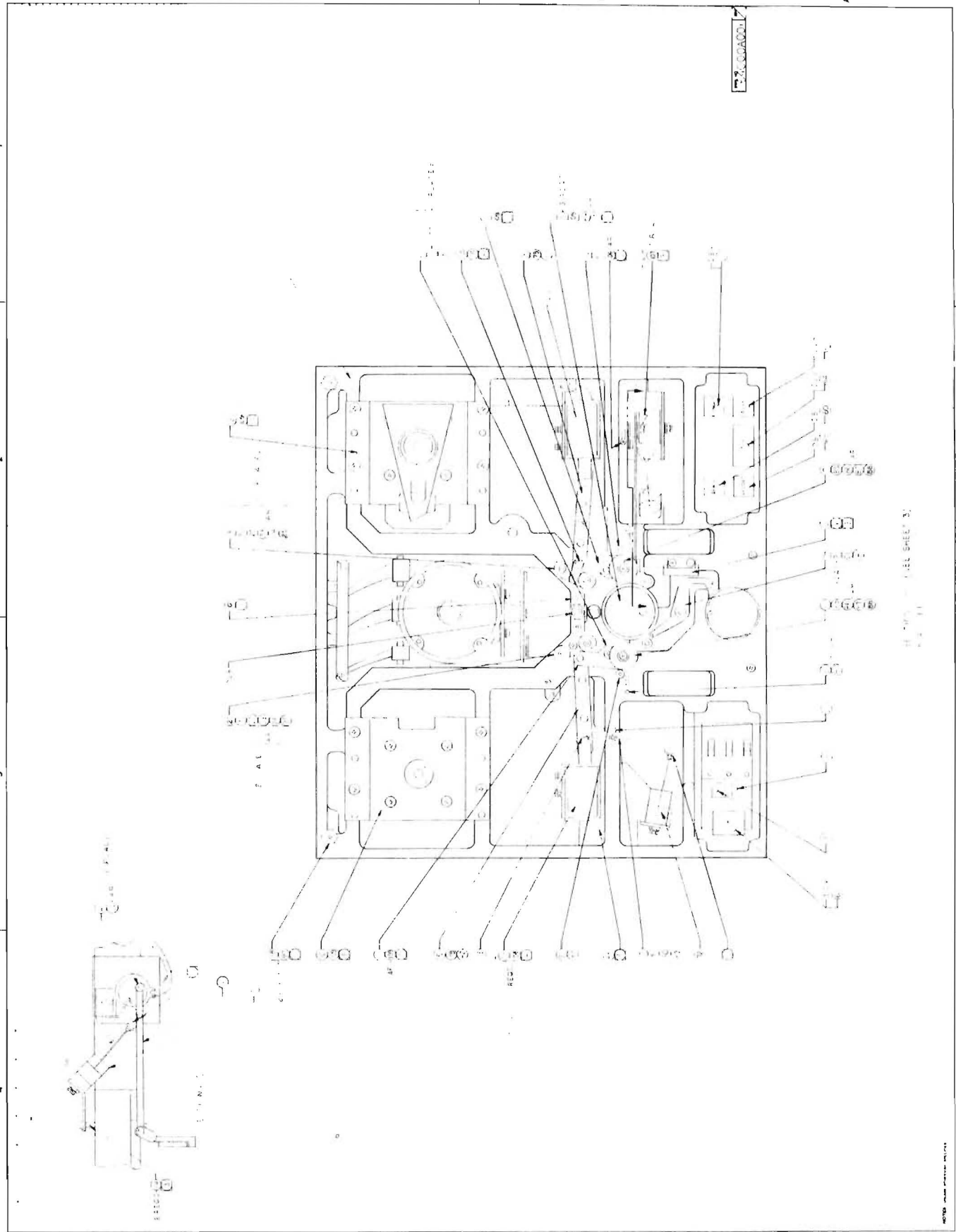


Figure 30. Tape Deck Assembly (Sheet 5 of 5)

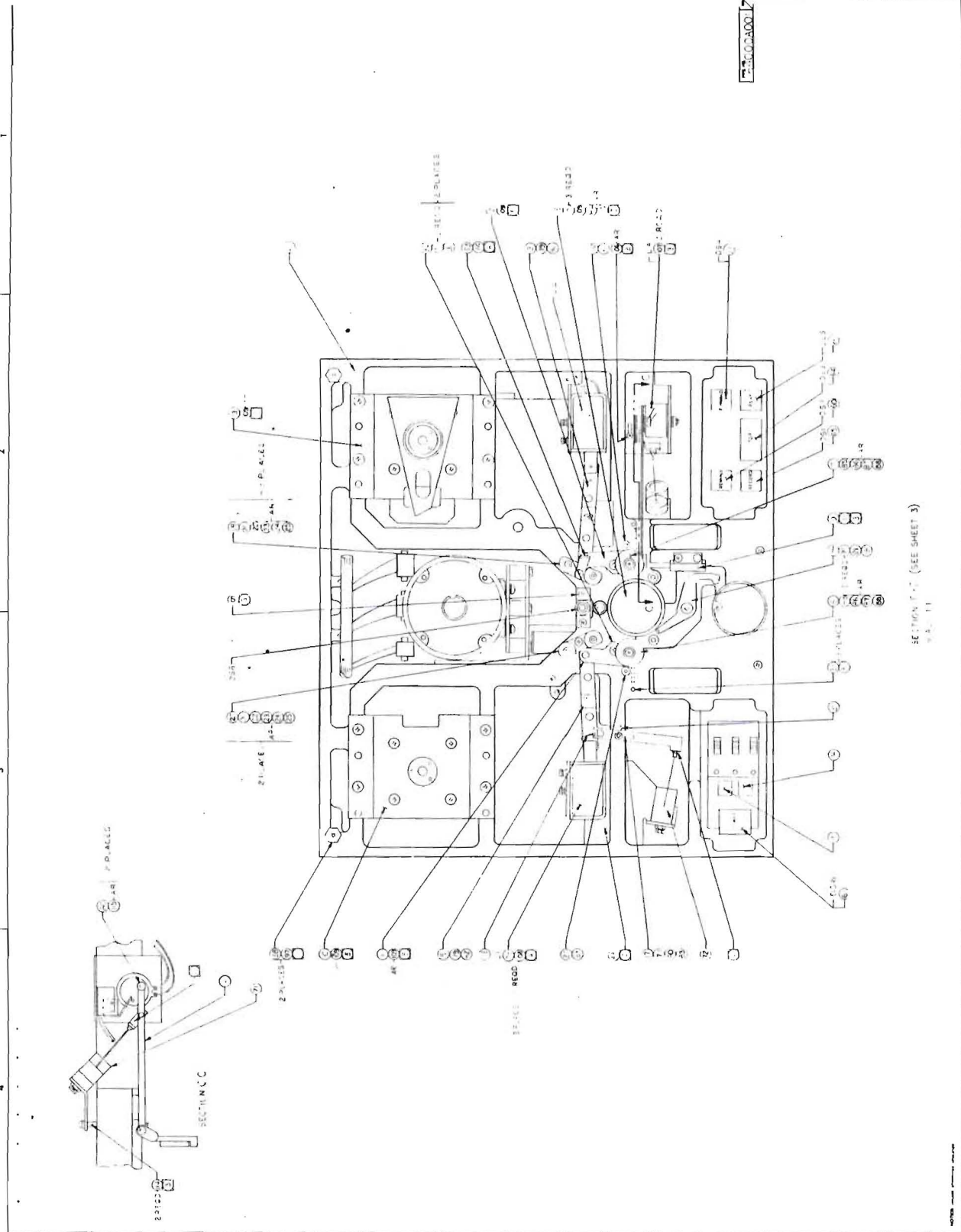


Figure 36. Tape Deck Assembly (Sheet 5 of 5)

M F G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,15-30,60 HZ

CATALOG NO. 83-5996-4001

PL 64000ACC2

REV B

REF.DES./FIND # ---EFF--- DRAWING NUMBER
 PEG. ENC. - MEGR PART NO.

MEGR NAME

D E S C R I P T I O N

PH CATALOG NUMBER QTY.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000011

1531

64007AC60-3

A MINCOM

MOT ASSY-CPSN,15-30 IPS,60 HZ

83-4560-0300

1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,7.5-15,50 HZ CATALOG NO. 83-5996-4002 PL 6400A003 REV B

REF.DFS./FIND # ---EFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PR CATALOG NUMBER QTY.

REF. ENC. - MFGR PART NO.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000011	1531	64007AC60-2	A MINCOM	MOT ASSY-CPSN,7 1/2-15IPS,50HZ	83-4560-0301	1
000031	1531	230078023	A MINCOM	CAP-CAPSTAN STROBE, 50 HZ	83-3250-0183	1

M E G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,15-30,50 HZ

CATALOG NO. 83-5996-4003

PL 64C00A004

REV B

REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	PFG. FND.	- MEGR PART NO.				

SAME AS 84000A001 EXCEPT AS NOTED BELOW

000011	1531	64007A060-4	A MINCOM	MOT ASSY-CPSN,15-30 IPS,50 HZ	83-4560-0302	1
000031	1531	23007B023	A MINCOM	CAP-CAPSTAN STROBE, 50 HZ	83-3250-0183	1
000124	428	23059B090-2	H MINCOM	PC BD ASSY-PREAMP,OVERDUB15/30	83-4930-2511	4

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/4 IN,2 TRK,7.5-15,60 HZ

CATALOG NO. 83-5996-4004

PL 64000AC05

REV B

REF.DES./FIND # ---FFF--- DRAWING NUMBER MFGR NAME DESCRIPTION PH CATALOG NUMBER QTY.
 BFG. ENC. - MFGR PART NO.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000016	450	64013AC80	B MINCOM	CHASSIS ASSY-TRANSPT ELECT,1/4	83-5920-1856	1
000027	450	23013B013-1	A MINCOM	TAPE GUIDE-INCOMING,1/4 IN	83-3240-0626	2
000028	450	23013B014-1	A MINCOM	TAPE GUIDE-CUTTING,1/4 IN	83-3240-0632	2
000117	450	23000A010-2	MINCOM	CABLE ASSY-INTERCONN,HDS,2 TRK	83-4570-0383	1
000127	450	64031AC00-2	A MINCOM	PWR SUP ASSY-ELECT,2 TRACKS	83-5920-1822	2
000128	450	23000BC20-2	E MINCOM	HD SET ASSY-REC/REP/ERASE,2 TK	83-5950-1228	1
000142	450	64028A030-1	A MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2375	1
000143	450	64028AC30-2	A MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2376	1
000183	450	23028AC45-3	A MINCOM	PLATE-COVER,DISPLAY PANEL	83-3320-2359	2

M F G P A R T S L I S T

TITLE ASSY-1/4 IN, 2 TRK, 15-30, 60 HZ

CATALOG NO. 83-5996-4005

PL 64000A006

REV C

REF. DES. / FIND # ---EFF---

DRAWING NUMBER

MFGP NAME

D E S C R I P T I O N

PH CATALOG NUMBER QTY.

REG. FNC. - MFGP PART NO.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000011	1531	64007A060-3	A MINCOM	MOT ASSY-CPSN, 15-30 IPS, 60 HZ	83-4560-0300	1
000016	1527	64013AC80	B MINCOM	CHASSIS ASSY-TRANSPT ELECT, 1/4	83-5920-1856	1
000027	486	23013BC13-1	A MINCOM	TAPE GUIDE-INCOMING, 1/4 IN	83-3240-0626	2
000028	486	23013B014-1	A MINCOM	TAPE GUIDE-OUTGOING, 1/4 IN	83-3240-0632	2
000117	487	23000AC10-2	MINCOM	CABLE ASSY-INTERCONN, HDS, 2 TRK	83-4570-0383	1
000124	486	23059B090-2	H MINCOM	PC BD ASSY-PRFAMP, OVERDUB 15/30	83-4930-2511	2
000127	486	64031ACC0-2	A MINCOM	PWR SUP ASSY-ELECT, 2 TRACKS	83-5920-1822	2
000128	494	23000B020-2	E MINCOM	HD SET ASSY-REC/REP/ERASE, 2 TK	83-5950-1228	1
000142	487	64028AC30-1	A MINCOM	BRACKET-MTG, SIG ELECT CONSOLE	83-3320-2375	1
000143	487	64028A030-2	A MINCOM	BRACKET-MTG, SIG ELECT CONSOLE	83-3320-2376	1
000183	491	23028A045-3	A MINCOM	PLATE-COVER, DISPLAY PANEL	83-3320-2359	2

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/4 IN,2 TRK,7.5-15,50 HZ

CATALOG NO. 83-5956-4006

PL 64CCCAC07

REV B

REF.DES./FIND # ---FFF--- DRAWING NUMBER MFGR NAME DESCRIPTION PH CATALOG NUMBER QTY.
 REG. FNC. - MFGR PART NO.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000011	1531	64007A060-2	A	MINCOM	MOT ASSY-CPSN,7 1/2-15IPS,50HZ	83-4560-0301	1
000016	1527	64013AC90	B	MINCOM	CHASSIS ASSY-TRANSPT ELECT,1/4	83-5920-1856	1
000027	486	23013B013-1	A	MINCOM	TAPE GUIDE-INCOMING,1/4 IN	83-3240-0626	2
000028	486	23013B014-1	A	MINCOM	TAPE GUIDE-CUTTING,1/4 IN	83-3240-0632	2
000031	1531	23007B023	A	MINCOM	CAP-CAPSTAN STROPE, 50 HZ	83-3250-0183	1
000117	487	23000AC10-2		MINCOM	CABLE ASSY-INTERCONN,HDS,2 TRK	83-4570-0383	1
000127	486	64031AC00-2	A	MINCOM	PWR SUP ASSY-ELECT,2 TRACKS	83-5920-1822	2
000128	494	23000B020-2	E	MINCOM	HD SET ASSY-REC/REP/FRASE,2 TK	83-5950-1228	1
000142	487	64028A030-1	A	MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2375	1
000143	487	64028A030-2	A	MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2376	1
000183	491	23028A045-3	A	MINCOM	PLATE-COVER,DISPLAY PANEL	83-3320-2359	2

M64 PAR 2-71

M F G P A R T S L I S T

TITL E ASSY-1/4 IN,2 TRK,15-30,50 HZ

CATALOG NO. 83-5296-4007

PL 64000A008

REV B

REF.DES./FIND # ---FFF---
REG. END. - MFG PART NO.

DRAWING NUMBER

MFG NAME

D E S C R I P T I O N

PH CATALOG NUMBER QTY.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000011	1531	64007A060-4	A MINCOM	MOT ASSY-CPSN,15-30 IPS,50 HZ	83-4560-0302	1
000016	1527	64013A080	B MINCOM	CHASSIS ASSY-TRANSPT ELECT,1/4	83-5920-1856	1
000027	486	23013B013-1	A MINCOM	TAPE GUIDE-INCOMING,1/4 IN	83-3240-0626	2
000028	486	23013B014-1	A MINCOM	TAPE GUIDE-OUTGOING,1/4 IN	83-3240-0632	2
000117	487	23000A010-2	MINCOM	CABLE ASSY-INTERCONN,HDS,2 TRK	83-4570-0383	1
000124	486	23059B090-2	H MINCOM	PC BD ASSY-PREAMP,OVERDUB15/30	83-4930-2511	2
000127	486	64031A000-2	A MINCOM	PWR SUP ASSY-ELECT,2 TRACKS	83-5920-1822	2
000128	494	23000B020-2	F MINCOM	HD SET ASSY-RFC/REP/ERASE,2 TK	83-5950-1228	1
000142	487	64028A030-1	A MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2375	1
000143	487	64028A030-2	A MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2376	1
000183	491	23028A045-3	A MINCOM	PLATE-COVER,DISPLAY PANEL	83-3320-2359	2

M64 PAR 2-71

M E G P A R T S L I S T

TITLE PCB ASSY-LOGIC TRANSPORT		CATALOG NO. 83-4930-3065		PL 640134060		REV A	
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PF CATALOG NUMBER	QTY.
REG. FND.		- MEGR PART NO.					
C1	450	TC2501	MALLORY	CAP-FXD,ELECT,	100UF 50V	83-1510-2045	1
C3	450	BR250-50	CORNELL DUBL	CAP-FXD,FLECT,	250UF 50V	83-1510-2031	1
C4,C5,C6	450	TYPE P123ZNP	AERVOIX	CAP-FXD,PAPER	.47UF 400V 20%	83-1510-4072	3
C7	450	TS05-20-686	COMP INC	CAP-FXD,TA,	68UF 20V 20%	83-1510-6211	1
C8,C9	450	TYPE P123ZNP	AERVOIX	CAP-FXD,PAPER,	.01UF 200V 25%	83-1510-4046	2
C10	450	0A836-5086	MINCOM SPEC	CAP-FXD,MICA,9100	UF 500V 5%	83-1510-5086	1
C11	450	313-M	ARCO	CAP-VAR,MICA,1000-2155PF	500V	83-1510-5001	1
C12	450	0D475XSC3532	SPRAGUE	CAP-FXD,TA,	4.7UF 35V 10%	83-1510-6095	1
CR1,CR3,CR4,CR6, CR7,CR8,CR9, CR10,CR13,CR14, CR15,CR16,CR17, CR18,CR19,CR20, CR21,CR24,CR25, CR26,CR27,CR28, CR29,CR30,CR31, CR32,CR37,CR38, CR39,CR40,CR41, CR46,CR47,CR48, CR49	480	IN4004	MOTOROLA	RECT-SI,DIF JCT,400PIV	1 AMP	83-1530-0151	31
CR50,CR51	450	MR1033A	MOTOROLA	RECT-SI, 300 PRV, 3.0 AMP		83-1530-0364	4
CR52,CR53	450	IN4750A		DIODE-SI,ZENER, 27 V, 1 W, 5%		83-1530-0439	2
	450	IN3002	MOTOROLA	DIODE-SI,ZENER, 75V	33 MA	83-1530-0301	2
F1	482	312004.	LITTELFUSE	FUSE-QUICK ACT,250V 4 AMP		83-7550-R016	1
K1,K2,K3,K4,K5, K6,K7,K9	450	KHP17D12-24	PCT & BRUMFO	RELAY-4FCT, 24 VDC 650 OHM		83-1550-3678	8
Q1,Q2,Q3	450	2N3053	R.C.A.	TSTR-SI,NPN, PWR,	60 VCR	83-1530-2180	3
R1	450	0A781-7331	MINCOM SPEC	RES-FXD,FILM,27 OHM,1/2W,2% S		83-1520-7331	1
R5	450	0A781-7221	MINCOM SPEC	RES-FXD,FILM,100 OHM,1/2W,2% S		83-1520-7221	1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE PCB ASSY-LOGIC TRANSPORT

CATALCG NO. 83-4930-3065

PL 64013A060

REV A

REF.DES./FIND #	---EFF--- BEG. END.	DRAWING NUMBER - MFG PART NC.	MFG NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
R6	450	1720	OHMITE	RES-FXD, WW,100 OHM 10W 5%	83-1520-8253	1
P7	450	0A781-7335	MINCOM SPEC	RES-FXD,FILM,39 OHM,1/2W,2%	83-1520-7335	1
R8	450	1730	OHMITE	RES-FXD, WW,500 OHM 10W 5%	83-1520-8007	1
R9	450	LITTLE DEVIL	OHMITE	RES-FXD,COMP,100 OHM 2W 5%	83-9520-5520	1
R10,R11	450	LITTLE DEVIL	OHMITE	RES-FXD,COMP,270 OHM 1W 5%	83-9520-4091	2
R12,R13	450	LITTLE DEVIL	OHMITE	RES-FXD,COMP,2.7 OHM 1W 5%	83-9520-4000	2
R14	450	LITTLE DEVIL	OHMITE	RES-FXD,COMP,1.2K OHM 1W 5%	83-9520-4153	1
R15	450	0A781-7355	MINCOM SPEC	RES-FXD,FILM,560 OHM,1/2W,2%	83-1520-7355	1
R16	450	LITTLE DEVIL	OHMITE	RES-FXD,COMP,150 OHM 1W 5%	83-9520-4134	1
R17,R18	450	0A781-7337	MINCOM SPEC	RES-FXD,FILM,47 OHM,1/2W,2%	83-1520-7337	2
R19,R20	450	0A781-7147	MINCOM SPEC	RES-FXD,FILM,4.7K OHM,1/2W,2%	83-1520-7147	2
R21,R22	450	0A781-7375	MINCOM SPEC	RES-FXD,FILM,33K OHM,1/2W,2%	83-1520-7375	2
R23	450	0A781-7325	MINCOM SPEC	RES-FXD,FILM,10 OHM,1/2W,2%	83-1520-7325	1
T1	450	00000A721	B MINCOM	XFMR-TORROIDAL,ARNOLD CORE	83-3540-1153	1
000001	450	9KH2	PCTTR & BRUM	SOCKET-RELAY,14 PIN	83-1620-0184	8
000002	450	23013BC61	A MINCOM	PC3460-LOGIC TRANSPORT	83-3640-1962	1
000003	450			NUT-HEX,SM PATT,6-32 X .250 WD	83-9260-2202	2
000004	484	64013A061	A MINCOM	LABEL-IC, LOGIC TRANSPORT	83-3550-1977	1
000005	450			SCREW-MACH,PAN HD,6-32 X 2 1/4	83-9260-4594	2
000006	450			WASHER-FLAT,SM PATT,#6	83-9261-4013	2
000007	450	MS3523E-41	MIL STD	WASHER-LOCK,SPLIT, #6	83-9261-4305	5
000010	450	2515	H.H.SMITH	INSULATOR-WASH, NYLON,#6	83-9630-0268	6
000011	450	#EXE-22-122	THERMAX	WIRE-TYPE C,22GA WHT TEFLN JKT	83-7910-0476	AR
000012	450	KHP	POTTER/BRUMF	SPG-HOLD DOWN,RELAY	83-1280-0571	8
000013	450	MS35206-227	MIL STD	SCREW-MACH,PAN HD,6-32 X 5/16	83-9260-4530	3
000014	450	MS27183-6	MIL STD	WASHER-FLAT,GENERAL PURPOSE,#6	83-9261-4004	3
000015	450	8070-E	LERCO	SPACFR-SLV, HEX, TAP, .500 LG	83-9350-0063	3
000016	450	4405	BUSSMANN MFG	FUSEHOLDER-BLOCK,AG 3 FUSE	83-1620-0001	1
000017	450	MS35206-215	MIL STD	SCREW-MACH,PAN HD,4-40 X 3/8	83-9260-4515	1
000018	450			WASHER-FLAT,.219 OD X .125 ID	83-9261-4012	1
000019	450	MS35335-29	MIL STD	WASHER-LOCK,FLAT,EXT T,#4	83-9261-4101	1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE PCB ASSY-LOGIC TRANSPORT

CATALOG NO. 83-493C-3065

PL 64013A060

REV A

REF.DES./FIND #	---FFF--- BEG. END.	DRAWING NUMBER - MFG PART NO.	MFG NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
000020	450			WASHER-FLAIN,.125 ID X.18700	83-9630-0115	1
000021	450			NUT-HEX,SM PATT,4-40 X .198 WD	83-9260-2201	4
000022	450	3025-0C5	3M	TUBING-CLEAR VINYL,.047 ID	83-7910-0272	AR
000023	450	10160-DAP	MILTON ROSS	PAD-TRANSISTOR,FOR TO-5 CASES	83-9690-0145	1
000024	450	7856	WALSCO	INSULATOR-WASHER,.140 ID	83-9630-0036	4
000025	450	2514	HF SMITH	WASHER-NYLON,FLAT,FOR #4 SCREW	83-9630-0435	1
000026	450	MS35206-238		SCREW-MACHINE,FAN HD,6-32X2.00	83-9260-4607	2

LAST OF 4 PAGES

MFG PARTS LIST

TITLE CHASSIS ASSY-TRANSP ELECT,1/4		CATALOG NO. 83-5920-1856		PL 64013A080		REV B	
RFF.DFS./FIND #	---EFF--- PFG. FND.	DRAWING NUMBER - MFGR PART NO.	MFGR NAME	DESCRIPTION	PL CATALOG NUMBER	QTY.	
000023	460		NATL WIRE	WIRE-TYPE B,20GA WHT NYLON JKT	83-7910-0035	AR	
000024	460		NATL WIRE	WIRE-TYPE B,20GA BLK NYLON JKT	83-7910-0039	AR	
000025	460	MIL-W-16878	NATL WIRE	WIRE-TYPE B,22GA WHT NYLON JKT	83-7910-0043	AR	
000026	460		NATL WIRE	WIRE-TYPE B,22GA WHT NYLON JKT	83-7910-0052	AR	
000027	460	#FXF-22-122	THERMAX	WIRE-TYPE C,22GA WHT TEFLN JKT	83-7910-0476	AR	
000028	460	#FXF-20-120	THERMAX	WIRE-TYPE C,20GA WHT TEFLN JKT	83-7910-0496	AR	
J2,J4	506	1-480275-0	AMP INC	SHELL-CONN,RECT, .650 WDX1.045	01 83-1610-0932	2	
J5,J6	506	2VK180/1-2	VIKING	CONN-P.C.,ELEC,PIERCD, 36 CON	01 83-1610-0782	2	
J7	508	1-480273-0	AMP INC	SHELL-CONN,RECT,.565 WDX.65	01 83-1610-0923	1	
J8	506	1-480323-0	AMP INC	SHELL-CONN,RECT, .650WDX1.280	01 83-1610-0934	1	
J9	506	1-480274-0	AMP INC	SHELL-CONN,RECT,.65 WD X.805	01 83-1610-0924	1	
J11	506	1-480304-0	AMP INC	SHELL-CONN,RECT, 3 POSITION	01 83-1610-1137	1	
P11	506	1-480305-C	AMP INC	SHELL-CONN,RECT,3 POS	01 83-1610-1142	1	
S1,S2,S3,S4,S5	508	1018	PENDAR	SWITCH-PUSHBUTTON,SPDT,LIGHTED	01 83-1550-5148	5	
S6	506		LIKON	SWITCH-ALTERNATE ACT,ILLUM	01 83-1550-5231	1	
S7,S9	506	TYPE SS16	STACKPOLE	SWITCH-SLIDE,DPTT	01 83-1550-5232	2	
S8	506	TYPE SS12	STACKPOLE	SWITCH-SLIDE,4PDT	01 83-1550-5230	1	
S10,S11	506	513-0101-604	DIALCO	SWITCH-MOMENTARY,MAKE	01 83-1550-5233	2	
S12	506	MS24547-1	MIL STD	SWITCH-BASIC,SPDT,28VDC 7 AMP	01 83-1550-5067	1	
000002	506	23013A017	B MINCOM	CHASSIS-SWITCH MTG,TRANSPORT	01 83-3310-0708	1	
000004	506	23013A016	C MINCOM	PLATE-SWITCH MTG,TRANSPORT	01 83-3320-1115	1	
000011	506	42993-1	AMP INC	CONTACT-ELEC,SOC, 16 SIZE	01 83-1610-0678	13	
000012	506	42991-1	4 AMP INC	SOCKET-CONTACT,CONN, SIZE 16	01 83-1610-0689	8	
000013	506	60618-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA	01 83-1610-0925	2	
000014	506	60510-4	AMP INC	CONTACT-ELEC,SOC,18-22GA SIZE	01 83-1610-0927	44	
000018	506	3006	F.H. SMITH	TERM BC-2.250 BETWEEN MTG HALF	01 83-1640-0588	2	
000020	506	RBP53	THOMS & BETS	TERM-LUG, INSUL,R TG, .31WD	01 83-9630-0206	2	
000030	506	RA853	THOMS & BETS	TERM-LUG, INSUL,R TG,.26WD	01 83-9630-0203	2	
000031	506	RAP73	THOM & BETTS	LUG-TERMINAL SOLDERLS,RING,#10	01 83-9630-0205	4	

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CHASSIS ASSY-TRANSP FLECT, 1/4

CATALOG NO. 83-5920-1856

PL 64013A080

REV B

REF.DES./FIND #	---FFF--- BEG. END.	DRAWING NUMBER - MFG PART NO.	MFG NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
-----------------	------------------------	----------------------------------	----------	-----------------------	-------------------	------

CR77	506	IN4004	MOTOROLA	RECT -SI, DIF JCT, 400PIV 1 AMP	02 83-1530-0151	1
K13	506	KHP17D12-24	POT & BRUMED	RELAY-4PDT, 24 VDC 650 OHM	02 83-1550-3678	1
R75	506	1723	OHMITE	RES-FXD, WW, 200 OHM 10W 5%	02 83-1520-8006	1
R76	506	LITTLE DEVIL	CHMITE	RES-FXC, COMP, 470 OHM 2W 5%	02 83-9520-5528	1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CHASSIS ASSY-TRANSPT ELECT,1/4		CATALOG NO. 83-5920-1856	PL 64C13A080	REV B
REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N
	REF. END.	- MEGR PART NO.		PH CATALOG NUMBER QTY.
000037	506	23013AC69	MINCOM	BRACKET-SUPPORT,DELAY RELAY
000038	506	9KH1	PCT.BRUM	SOCKET-RELAY,14CCNT
				02 83-3320-1686 1
				02 83-1620-0108 1

M64 PAR 2-71

187/188

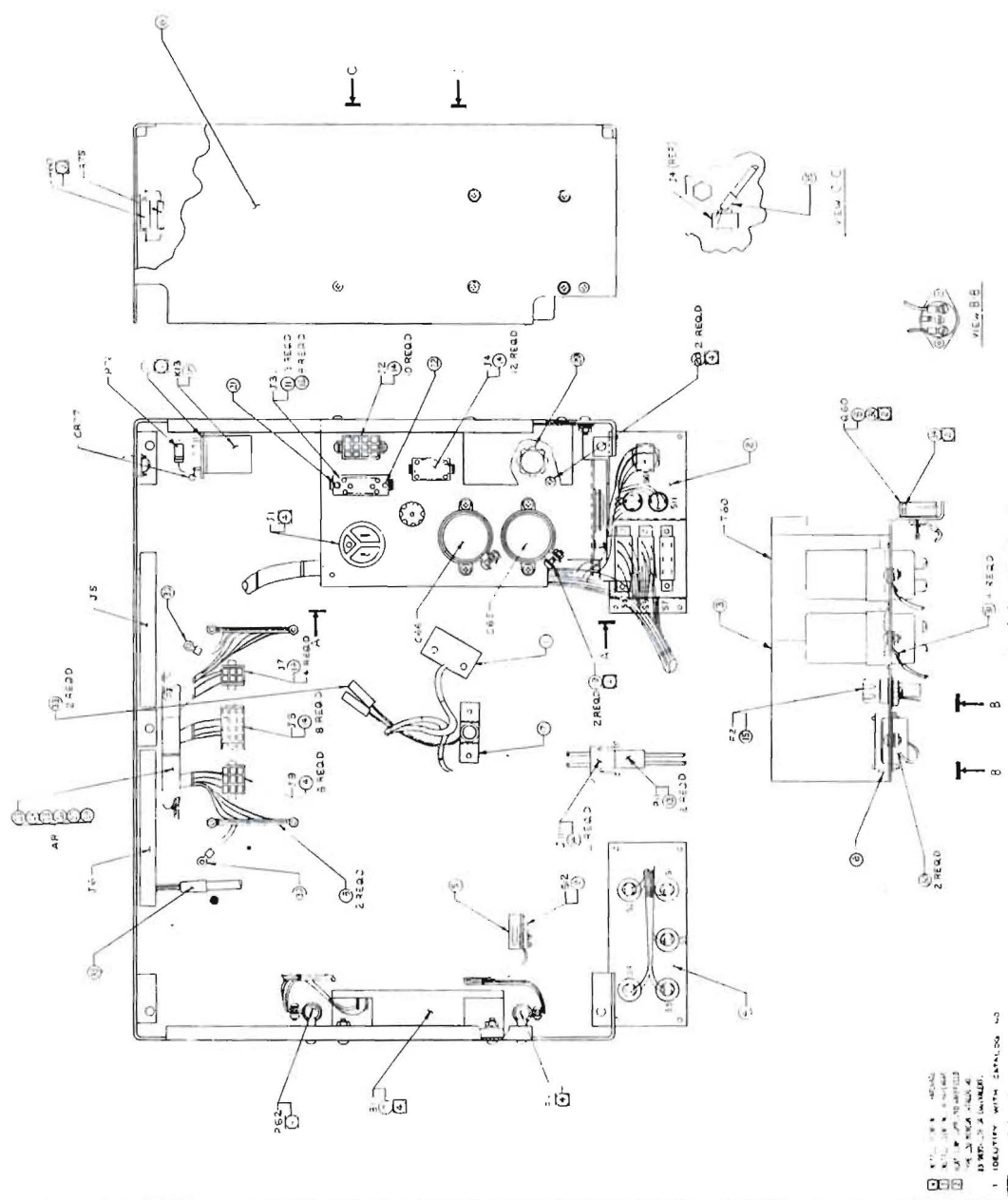


Figure 37. Remote Control Assembly

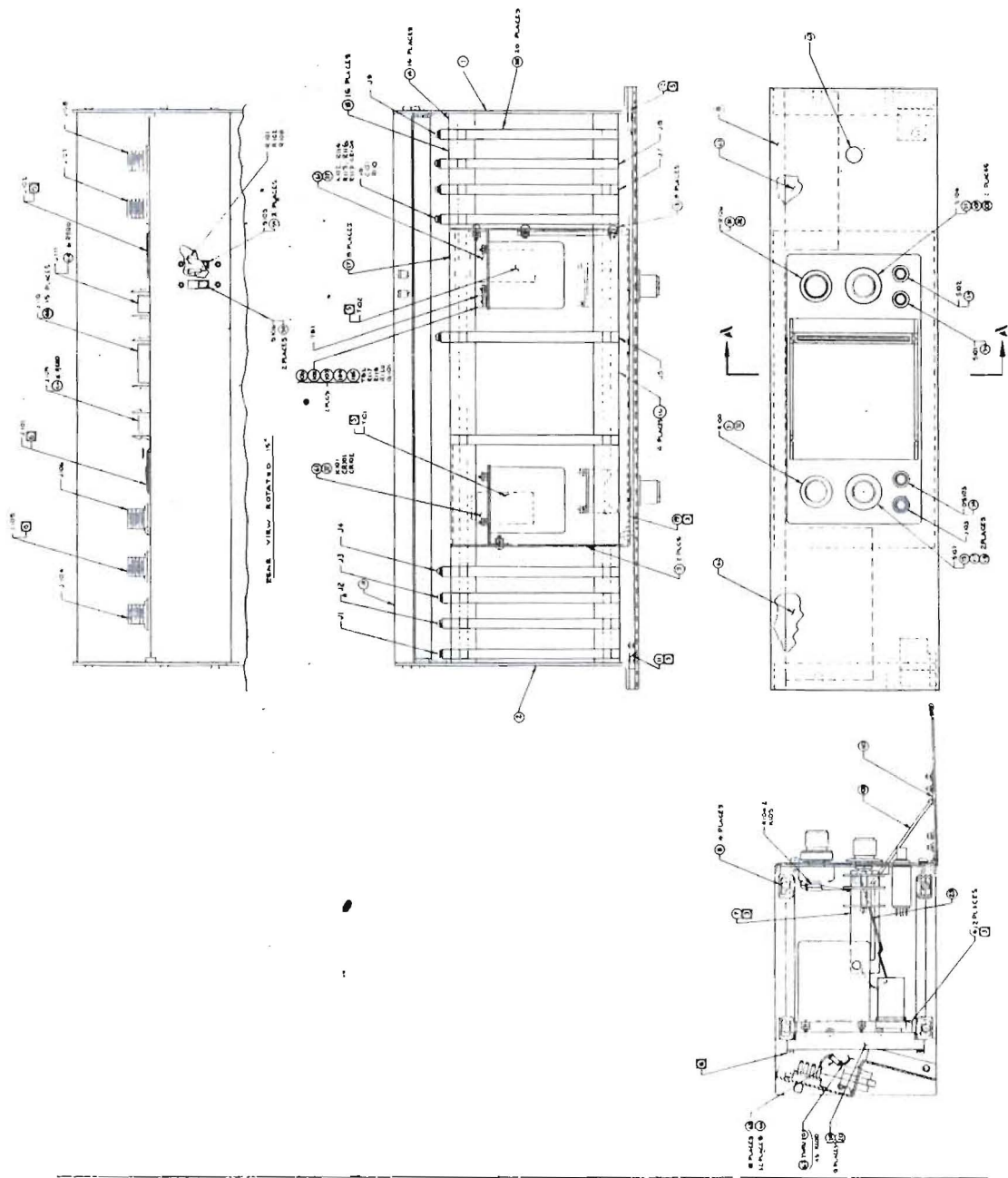


Figure 38. Audio Signal Electronics Housing Assembly

M F C P A R T S L I S T

TITLE CHASSIS ASSY-TRANSP ELECT, 1/2 CATALOG NO. 83-592C-1857 PL 64013A085 REV B
 REF.DES./FIND # ---EFF--- DRAWING NUMBER MFCR NAME DESCRIPTION PH CATALOG NUMBER QTY.
 BFG. END. - MFCR PART NO.

USE PART LIST AND DRAWING 64013A080 FOR PARTS AND PART NUMBERS.

ASSEMBLY 64013A085 DOES NOT CONTAIN CR77, K13, R75, R78, AND FIND NO's 37 AND 38

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CABLE ASSY-METER DISPLAY,4 TRK

CATALOG NO. 83-457C-08C5

PL 64028A02C-1

REV B

REF. DES./FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
BFG. FND.		- MFGR PART NO.				
000001		7-07	LEECRAFT	LAMPHOLDER-MINTR BAYONET, 3 1/4	83-1620-0258	8
000002		1-480276-0	AMP INC	SHELL-CANN, RECT, .665 WD X.850	83-1610-0929	4
000003		60618-4	AMP INC	CONTACT-ELEC, PIN, .084 DIA	83-1610-0925	16
000004			NATL WIRE	WIRE-PVC, TYPE B, 22GA YELLOW	83-7910-0040	AR
000005			NATL WIRE	WIRE-TYPE B, 22GA VIO NYLON JKT	83-7910-0041	AR
000006			NATL WIRE	WIRE-PVC, TYPE B, 22GA GRAY	83-7910-0042	AR
000007			NATL WIRE	WIRE-TYPE B, 22GA BLU NYLON JKT	83-7910-0044	AR
000008				WIRE-TYPE B, 22 GA, VIOLET-WHITE	83-7910-0068	AR
000009			ALTO LITE	WIRE-TYPE B, 22GA GR/WT NYL JKT	83-7910-0170	AR
000010			NATL WIRE	WIRE-TYPE B, 22GA, GRN NYLN JKT	83-7910-0248	AR
000011			NATL WIRE	WIRE-TYPE B, 22GA RED NYLON JKT	83-7910-0249	AR
000012			NATL WIRE	WIRE-TYPE B, 22 GA ORNG NYL JKT	83-7910-0250	AR
000013			NATL WIRE	WIRE-TYPE B, 22GA, BRN NYLN JKT	83-7910-0251	AR
000014				WIRE-TYPE B, 22 GA YELLOW NYLN	83-7910-0259	AR
000015				WIRE TYPE B, 22 GA GRAY NYLN	83-7910-0261	AR
000016				WIRE-TYPE B, 22 GA RED NYLN JKT	83-7910-0264	AR
000017				WIRE-TYPE B, 22 GA BLU NYLN JKT	83-7910-0288	AR
000018				WIRE-TYPE B, 22GA BRN NYLN JKT	83-7910-0301	AR
000019				WIRE-TYPE B, 22 GA ORN NYLN JKT	83-7910-0303	AR
000020		RA873	THOM & BETTS	LUG-TERMINAL SOLDERLS, RING, #10	83-9630-0205	8
000021		3025-090	3M	TUBING-SCOTCHTITE, 7/16 ID	83-7910-0281	AR

LAST OF 2 PAGES

M64 PAR 2-71

M E G P A R T S L I S T

TITLE CABLE ASSY-METER DISPLAY,2 TRK		CATALOG NO.	83-457C-0806	PL	64028AC2C-2	REV	B
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER	QTY.
	REF. FND.	- MEGR PART NO.					
000001		7-07	LEECRAFT	LAMPHOLDER-MINTP BAYCNET,3 1/4		83-1620-0258	4
000002		1-480276-0	AMP INC	SHELL-CCNN,RECT, .665 WD X.850		83-1610-0929	2
000003		60618-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA		83-1610-0925	8
000004			NATL WIRE	WIRE-PVC,TYPE B, 22GA YELLOW		83-7910-0040	AR
000005			NATL WIRE	WIRE-TYPE B,22GA VIO NYLON JKT		83-7910-0041	AR
000006			NATL WIRE	WIRE-PVC, TYPE B, 22GA GRAY		83-7910-0042	AR
000007			NATL WIRE	WIRE-TYPE B,22GA BLU NYLON JKT		83-7910-0044	AR
000008				WIRE-TYPE B,22 GA,VIOLET-WHITE		83-7910-0068	AR
000009			ALTOLITE	WIRE-TYPE B,22GA GR/WT NYL JKT		83-7910-0170	AR
000010			NATL WIRE	WIRE-TYPE B,22GA,GRN NYLN JKT		83-7910-0248	AR
000011			NATL WIRE	WIRE-TYPE B,22GA RED NYLON JKT		83-7910-0249	AR
000012			NATL WIRE	WIRE-TYPE B,22 GA ORNG NYL JKT		83-7910-0250	AR
000013			NATL WIRE	WIRE-TYPE B,22GA,BRN NYLN JKT		83-7910-0251	AR
000014				WIRE-TYPE B,22 GA YELLOW NYLN		83-7910-0259	AR
000015				WIRE TYPE B,22 GA GRAY NYLN		83-7910-0261	AR
000016				WIRE-TYPE B,22 GA RED NYLN JKT		83-7910-0264	AR
000017				WIRE-TYPE B,22 GA BLU NYLN JKT		83-7910-0288	AR
000018				WIRE-TYPE B,22GA BRN NYLN JKT		83-7910-0301	AR
000019				WIRE-TYPE B,22 GA ORN NYLN JKT		83-7910-0303	AR
000020		RA873	THOM & BETTS	LUG-TERMINAL SOLDERLS,RING,#10		83-9630-0205	4

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A P T S L I S T

TITLE	CABLE ASSY-STPDN XFMR, 4 TRACK	CATALOG NO.	83-4570-C803	PL	64028A040	REV	A
REF. DES. / FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.	
REF. END.	REF. END.	- MFGR PART NO.					
EJ4		1-480275-0	AMP INC	SHELL-CCNN, RECT, .650 WDX1.045	83-1610-0932	1	
EP4		1-480278-0	AMP INC	SHELL-CCNN, RECT, 12 POSITIONS	83-1610-0931	1	
J109		1-480273-0	AMP INC	SHELL-CCNN, RECT, .565 WDX.65	83-1610-0923	4	
P109		1-480276-0	AMP INC	SHELL-CCNN, RECT, .665 WD X.850	83-1610-0929	4	
T1		17644	ADC	XFMR-POWER, STEPPDOWN, 110 V	83-1540-1321	1	
000001		60618-4	AMP INC	CONTACT-ELFC, PIN, .084 DIA	83-1610-0925	36	
000002		60510-4	AMP INC	CONTACT-ELFC, SOC, 18-22GA SIZE	83-1610-0927	36	
000003		GSR134C	THOM & BETTS	FERRULE-RF CABLE GND .134ID	83-9690-0020	6	
000004		GSC194C	THOMAS & BETTS	FERRULE-RF CABLE GROUNDING	83-9690-0118	6	
000005		NR1934N2SJ	NATL WIRE	WIRE-TYPE B, 22GA RED/BLU 2 CCN	83-7910-0362	AR	

LAST OF 2 PAGES

M E G P A R T S L I S T

TITLE PWR SUP ASSY-ELECT,4 TRACKS

CATALOG NO. 83-5920-1821

PL 64031ACCC-1

REV A

REF.DES./FIND # ---EFF--- DRAWING NUMBER MEGR NAME D E S C R I P T I O N PF CATALOG NUMBER QTY.
BEG. END. - MEGR PART NO.

C1		HC5020A	MALLORY	CAP-FXC,ELECT,2000 UF,50 WVCC	83-1510-2075	1
C2,C4	468	CS13BF476K	MIL STD	CAP-FXC,TA 47 UF, 35 V, 10%	83-1510-6085	2
C3	468	DD102	AFRCVOX	CAP-FXC,CFR, 1000PF 1000V GMV	83-1510-1024	1
CR1,CR2,CR3,CR4,CR5	468	IN4004	MOTOROLA	RECT-SI,DIF JCT,400PIV 1 AMP	83-1530-0151	5
CR6	468	IN754A	TEXAS INST	DIODE-SI, ZENER, 6.8V 400 MW	83-1530-0097	1
F1	468	312002	LITTELFUSE	FUSE-2AMP 250V 3AG QUICK	83-7550-8008	1
Q1		2N3055	R.C.A.	TSTR-SI,APN, PWR, 100 VCR	83-1530-2157	1
Q2,Q3,C4	468	2N3417	G.F.	TSTR-SILICON,NPN,SMALL SIGNAL	83-1530-2236	3
R1	468	BWH	INTNATNL RES	RESISTOR-WW 1 OHM, 1W, 10%	83-1520-8261	1
R2	468	4334	OHMITE	RES-FXC,W/W,1.5 OHM 3 W 5 %	83-1520-7771	1
R3	468	0A781-7148	MINCOM SPEC	RES-FXD,FILM,1CK OHM,1/2W,2% S	83-1520-7148	1
R4,R6	468	0A781-7147	MINCOM SPEC	RES-FXC,FILM,4.7K OHM,1/2W,2%	83-1520-7147	2
R5	468	0A781-7350	MINCOM SPEC	RES-FXD,FILM,330 OHM,1/2W,2% S	83-1520-7350	1
R7	468	0A781-7372	MINCOM SPEC	RES-FXD,FILM,22K OHM,1/2W,2% S	83-1520-7372	1
R8	468	0A781-7368	MINCOM SPEC	RES-FXD,FILM,7.5K OHM,1/2W,2% S	83-1520-7368	1
R11	468	LITTLE DEVIL	OHMITE	RES-FXD,COMP,270 OHM 1W 5%	83-9520-4091	1
R12	468	RC32GF3315	MIL-R-11D/6	RESISTOR-CARBON, 330 OHM 1W-5%	83-9520-4140	1
R13	468	LITTLE DEVIL	OHMITE	RESISTOR-CAR, 220 OHM-1W-5%	83-9520-4137	1
000001		CMC-28A	SPRAGUE	RETAINER-CAP MTG,RING TYPE	83-1650-0148	1
000002		BBTC-3-62	BRUSH-BERYLM	PAO-TSTR,1.05 WC X 1.563 LG	83-1690-0187	1
000003		23059AC17	MINCOM	CHAS-COMP MTG,SIG ELECTRONICS	83-3310-0852	1
000004		23059A011	C MINCOM	PLATE-MTG,METER MODULE	83-3320-1126	1
000005		23059AC08	MINCOM	BRKT-METER MTG,SIG ELECTRONICS	83-3320-1131	1
000006		23059AC09	MINCOM	SPACER-METER PANEL,SIG ELFC	83-3350-0384	4
000007	468	23059PC56	A MINCOM	PC3230-FCWER SUPPLY	83-3640-1872	1
000008		7856	WALSCO	INSULATOR-WASHER,.140 ID	83-9630-0036	2
000009		1414-6	PF SMITH	TERM STRIP-GNDING,#6 SCREW MTG	83-9630-0086	1

M64 PAR 2-71

MFG PARTS LIST

TITLE PWR SUP ASSY-ELECT, 4 TRACKS

CATALOG NO. 83-592C-1821

PL 64031A000-1

REV A

REF.DES./FIND #	---FFF---	DRAWING NUMBER	MFGR NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.
REQ. END.		- MFGP PART NO.				
000010	415	23028A045-2	A MINCOM	PLATE-COVER, DISPLAY PANEL	83-3320-2358	1
000011	415	04032.C02-1	E MINCOM	HANDLE-FULL, 1.517 LCNG	83-3270-0144	1
000012	468	7717-2	THERMALLOY	PAD-TSTR, INLINE, 3 LEADS	83-9690-0191	3
000014	468			TUBING-TFFLON, #18 .047 ID, NAT	83-7910-0333	AR

LAST OF 3 PAGES

M F G P A R T S L I S T

TITLE PWR SUP ASSY-FLECT, 2 TRACKS CATALOG NO. 83-5920-1822 PL 64031A000-2 REV A
REF. DES. / FIND # ---EFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
BFG. END. - MFGR PART AC.

SAME AS 64031A000-1 EXCEPT FOR F1, T1, 000007, AND 000014

F1	468	31201.5	LITTELFUSE	FUSE-3AG-1.5 AMP.	83-7550-8009	1
T1		23009AC04	A MINCOM	XFMR-POWER, TRANSPORT ELFCT	83-3540-1141	1
000007	468	23059AC56	D MINCOM	PC704-PCWER SUPPLY, SIG ELECT	83-3640-0597	1

M E G P A R T S L I S T

TITLE	PWR SUP ASSY-ELECT, 2 TRACKS	CATALOG NO.	83-5920-1822	PL	64031A000-2	REV	A
REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER QTY.	
	BFG. END.	- MEGR PART NO.					
000014	468	#EXF-22-122	THERMAX	WIRE-TYPE C, 22GA WHT TFFLN JKT		83-7910-0476	AR

M F G P A R T S L I S T

TITLE HSG ASSY-SIG FLECT,REC/REF		CATALOG NO.	83-4930-2980	PL	64059A010	REV	C
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.	
REG. END.		- MEGR PART NO.					
C101		CSI3BF476K	MIL STD	CAP-FXD,TA 47 UF, 35 V, 10%	83-1510-6085	1	
CR101,CR102,	467	IN4004	MOTOROLA	RECT -SI,DIF JCT,400PIV 1 AMP	83-1530-0151	3	
CR104							
DS103		RDL-A1F1-0000	TSTR ELECT	LIGHT-INDICATOR,P2STC,RED	83-1550-2582	1	
J101		D3F	SWITCHCRAFT	CONN-RECP,ELEC,FNL MTG, 3 SOC	83-1610-1105	1	
J102		D3M	SWITCHCRAFT	CONN-RECP,ELEC,FNL MTG, 3 PIN	83-1610-1106	1	
J103		N-111	SWITCHCRAFT	JACK-TEL,2 CONDUCTOR,INSULATED	83-1610-0885	1	
J104,J105,J106,		MS3102F10SL-3P	MIL STD	CCNN-RECP,BOX MTG,3 PIN CNT	83-1610-1510	5	
J107,J108							
J109,J111		1-480273-0	AMP INC	SHELL-CCNN,RECT,.565 WDX.65	83-1610-0923	2	
J110		1-480223-0	AMP INC	SHELL-CCNN,RECT,.650WDX1.280	83-1610-0934	1	
K101,K102		KHP17D11	PCTTR & BRUM	RELAY-4PDT,650 OHM 24VDC 3 AMP	83-1550-3550	2	
Q101		2N3391A	GENERAL ELEC	TSTR-SI,NPN, PWR, 25 VCB	83-1530-2230	1	
R100		302163	CTS OF BERNE	RES-VAR, WW, 2K OHM 5W 5%	83-1520-1299	1	
R101		0A781-7356	MINCOM SPEC	RES-FXC,FILM,620 OHM,1/2W,2% S	83-1520-7356	1	
R102,R118		0A781-7202	MINCOM SPEC	RES-FXD,FILM,150 OHM,1/2W,2% S	83-1520-7202	2	
R104,R105		0A781-7365	MINCOM SPEC	RES-FXD,FILM,5.6K OHM,1/2W,2% S	83-1520-7365	2	
R106		301073	CTS OF BERNE	RES-VAR,COMP,10K OHM,2W,30%	83-1520-1336	1	
R108		0A781-7350	MINCOM SPEC	RES-FXD,FILM,330 OHM,1/2W,2% S	83-1520-7350	1	
R110		LITTLE DEVIL	CHMITE	RES-FXC,COMP,33 OHM,1 W, 5%	83-9520-4120	1	
R114		LITTLE DEVIL	CHMITE	RES-FXD,COMP,270 OHM 1W 5%	83-9520-4091	1	
R115,R117		LITTLE DEVIL	CHMITE	RES-FXC,COMP,390 OHM 1W 5%	83-9520-4142	2	
R116		0A781-7360	MINCOM SPEC	RES-FXD,FILM,2.2K OHM,1/2W,2% S	83-1520-7360	1	
R119		0A781-7359	MINCOM SPEC	RES-FXD,FILM,1.2K OHM,1/2W,2% S	83-1520-7359	1	
R120		0A781-7367	MINCOM SPEC	RES-FXD,FILM,6.8K OHM,1/2W,2% S	83-1520-7367	1	
S101		SFF DESC	DIALCO	SWITCH-FB, 922-1141-1572-523	83-1550-5227	1	

M64 PAR 2-71

M F G P A R T S L I S T

TITLE HSG ASSY-SIG FLECT, RFC/RFP		CATALOG NO. 83-4930-2980		PL 64059A010		REV C
REF.DES./FIND #	---FFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	REG. FNC.	- MFGR PART NO.				
S102		SEE DESC	DIALCO	SWITCH-FB, 922-1141-1573-523	83-1550-5226	1
S103, S104		00000A952-2	A MINCOM	SWITCH-ROT, PHEN, 115VAC 230 MA	83-1550-5225	2
S105		SS43	STACKPOLF	SWITCH-SLIDE, SP 3 POSITION	83-1550-5228	1
S106		SS50	STACKPOLF	SWITCH-SLIDE, DPDT	83-1550-5229	1
T101		23059A025	B MINCOM	XFMR-AUDIO INPUT	83-3540-1122	1
T102		23059AC29	A MINCOM	XFMR-AUDIO OUTPUT, SIG ELECT	83-3540-1109	1
T81, T82		4-01769	ALCON	TERM BD-5 POS, .325 WD X1.312 LG	83-1640-0625	2
000001		23059AC01-1	D MINCOM	PLATE-HSG MTG, RH, SIG ELECT	83-3320-1128	1
000002		23059A001-2	D MINCOM	PLATE-MTG, HSN, RH, SIGNAL FLECT	83-3320-1129	1
000003		23059A006-1	E MINCOM	PLATE-PANEL MTG, LH, SIG ELECT	83-3320-1130	2
000005		23059AC04	B MINCOM	SUPPORT-ROD, GUIDE, P.C. BGARD	83-3340-0389	4
000006		23059A024	E MINCOM	BRACKET-XFMR MTG, SIGNAL ELECT	83-3320-1133	2
000007		23059AC26	B MINCOM	BRACKET-SLOTTED, DOOR STOP	83-3320-1127	1
000008		23059A003-2	A MINCOM	PANEL-FRONT, SIGNAL ELECTRONICS	83-3360-1663	1
000011		23059A013-1	B MINCOM	HINGE-BUTT, DOOR LEAF, LH	83-3270-0475	1
000012		23059A013-2	B MINCOM	HINGE-BUTT, DOOR LEAF, RH	83-3270-0476	1
000013		R102-125	SCANBE	SPACER-GUIDE, P.C. BD, .125 THK	83-1350-0385	8
000014		00000A614-7	G MINCOM	SPACER-P.C. BD, CHAN, .500 LG	83-3350-0236	16
000015		00000A614-9	G MINCOM	SPACER-P.C. BD, CHAN, .625 LG	83-3350-0238	16
000016		00000A614-21	G MINCOM	SPACER-P.C. BD, CHAN, 2.941 LG	83-3350-0386	4
000017		00000A614-22	G MINCOM	SPACER-P.C. BD, CHAN, 3.190 LG	83-3350-0387	8
000018		23059A002	D MINCOM	PANEL-CONNECTOR MTG, SIG ELECT	83-3360-0730	1
000019		23059A007	B MINCOM	PANEL-FRONT, COMPONENT MTG	83-3360-0729	1
000020		C91-0024-000	VIKING	INSERT-CLARIZING, CONN, .300 LG	83-1610-0760	9
000023		23059A028	B MINCOM	SPRING-DOOR CATCH, SIG ELECT	83-3280-0447	1
000031		KL7C1	RAYTHEON	LOCK-DIAL, KNOB, RD, 1.00 DIA	83-1270-0388	2
000032		DS70-1-2	RAYTHEON	KNOB-CONTROL, RD, UNSKIRTED	83-1270-0486	2
000033		DS70-3-2	RAYTHEON	KNOB-CONTROL, RD, SKIRTED	83-1270-0487	2
000034		327	GENERAL ELEC	LAMP-INCANDESCENT, .04 AMP	83-1550-2506	3
000035		R-301-51A	SCANBE	GUIDE-P.C. BD, 5.287 LG	83-1340-0393	20
000037		9KH1	PCT.BRUM	SOCKET-RELAY, 14CONT	83-1620-0108	2

M64 PAR 2-71

MFG PARTS LIST

TITLE HSG ASSY-SIG ELEC, REC/REP		CATALOG NO.	83-4930-2980	PL	64059A010	REV	C
RFF.DFS./FIND #	---EFF---	DRAWING NUMBER	MFG NAME	DESCRIPTION		PH CATALOG NUMBER	QTY.
BEG. END.		- MFG PART NO.					
000038		2VK22S/1-2	VIKING	CONN-P.C., ELEC, PIERCD,	22 CON	83-1610-0845	9
000044		60510-4	AMP INC	CONTACT-ELEC, SCC, 18-22GA	SIZE	83-1610-0927	27
000059		SE-45 BRASS	UNITED SHOE	FYELET-MET,	.121 OD X.169LG	83-7290-0097	4
000060	1547	7308	WALSCO	BUTTON-FLUG, FOR	.375 DIA HOLE	83-7270-0139	1
000061		KHP	POTTER/BRUMF	SPG-HOLD DOWN, RELAY		83-1280-0571	2
000062		23059A012-1	B MINCOM	LABEL-I.D, NAB & DYNATRACK,	LH	83-3550-1573	1
000063		23059A012-2	B MINCOM	LABEL-I.D, NAB & DYNATRACK,	RF	83-3550-1574	1
000064		00000A769	C MINCOM	LABEL-IDENTIFICATION, MODULE		83-3550-1621	1
000065		YEC 120	BURNDY	FERRULE-RF CABLE GND,	.300 OD	83-9690-0240	18
000066		YEC-100	BRUNDY	FERRULE-RF CABLE YEL,	.270 OD	83-9690-0212	32
000067			NATIONAL	WIRE, PVC, SHIELDED	24GA 2COND	83-7910-0511	AR
000068			NATL WIRE	WIRE-TYPE B, 22GA	WHT NYLON JKT	83-7910-0052	AR
000069		1561-2	ALPHA WIRE	WIRE-TYPE MW, 22GA	BLK NYLN JKT	83-7910-0460	AR
000070		1561-3	ALPHA WIRE	WIRE-TYPE MW, 22GA	RED NYLN JKT	83-7910-0461	AR
000071		1561-8	ALPHA WIRE	WIRE-TYPE MW, 22GA	ORNG NYL JKT	83-7910-0462	AR
000072		1561-5	ALPHA WIRE	WIRE-TYPE MW, 22GA	YEL NYLN JKT	83-7910-0463	AR
000073		1561-6	ALPHA WIRE	WIRE-TYPE MW, 22GA	BLU NYLN JKT	83-7910-0464	AR
000074		1561-1	ALPHA WIRE	WIRE-TYPE MW, 22GA	WHT NYLN JKT	83-7910-0467	AR
000075			NATL WIRE	WIRE-PVC, TYPE B,	22GA YELLOW	83-7910-0040	AR
000076			NATL WIRE	WIRE-TYPE B, 22GA	VIO NYLON JKT	83-7910-0041	AR
000077			NATL WIRE	WIRE-PVC, TYPE B,	22GA GRAY	83-7910-0042	AR
000078		MIL-W-16878	NATL WIRE	WIRE-TYPE B, 22GA	WHT NYLON JKT	83-7910-0043	AR
000079			NATL WIRE	WIRE-TYPE B, 22GA	BLU NYLON JKT	83-7910-0044	AR
000080			NATL WIRE	WIRE-TYPE B, 22GA	BLK NYLON JKT	83-7910-0045	AR
000081			NATL WIRE	WIRE-TYPE B, 22GA,	GRN NYLN JKT	83-7910-0248	AR
000082			NATL WIRE	WIRE-TYPE B, 22GA	RED NYLON JKT	83-7910-0249	AR
000083			NATL WIRE	WIRE-TYPE B, 22 GA	ORNG NYL JKT	83-7910-0250	AR
000084			SURPRENANT	WIRE-PVC TYPE B,	22 GA, RED-BLK	83-7910-0066	AR
000085			SURPRENANT	WIRE-PVC, B NYLCN,	22GA, YEL-BLK	83-7910-0067	AR
000086			SURPRENANT	WIRE-PVC, B NYLCN,	22GA, GRN-BLK	83-7910-0069	AR
000087			SURPRENANT	WIRE-PVC, B NYLCN,	22GA, BLU-PLK	83-7910-0070	AR
000088			NATL WIRE	WIRE-TYPE B, 22GA	WHT/BLK NYLN	83-7910-0262	AR
000089			NATL WIRE	WIRE-TYPE B, 22GA	CRN/BLK NYLN	83-7910-0297	AR

M64 PAR 2-71

201

M E G P A R T S L I S T

TITLE HSG ASSY-SIG ELECT, REC/REP

CATALOG NO. 83-4930-2980

PL 64059A010

REV C

REF. DES. / FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.
	REF. END.	- MEGR PART NO.				
000090			NATL WIRE	WIRE-TYPE B, 22GA GRY/BLK NYLN	83-7910-0298	AR
000091			NATL WIRE	WIRE-TYPE B, 22GA PR/BLK NYLN	83-7910-0299	AR
000092			NATL WIRE	WIRE-PVC, B NYLCN, 22GA, BPN-BLK	83-7910-0300	AR
000093				WIRE-TYPE B, 22 GA, VIOLET-WHITE	83-7910-0068	AR
000094			SURPRENANT	WIRE-PVC, B NYLON, 22GA, BLK-WHT	83-7910-0071	AR
000095				WIRE-TYPE B, 22 GA YELLOW NYLN	83-7910-0259	AR
000096			NATL WIRE	WIRE-PVC TYPE B, 22 GA, GRN-WHT	83-7910-0260	AR
000097				WIRE TYPE B, 22 GA GRAY NYLN	83-7910-0261	AR
000098				WIRE-TYPE B, 22 GA RED NYLN JKT	83-7910-0264	AR
000099				WIRE-TYPE B, 22 GA BLU NYLN JKT	83-7910-0288	AR
000100				WIRE-TYPE B, 22GA BRN NYLN JKT	83-7910-0301	AR
000101				WIRE-TYPE B, 22 GA DRN NYLN JKT	83-7910-0303	AR
000102		MS35206-205	MIL STD	SCREW-MACH, PAN HD, 2-56 X 3/8	83-9260-4504	2
000103				WASHER-FLAT, SM PATT, #2	83-9261-4011	2
000104		MS35338-39	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #2	83-9261-4301	2
000105				NUT-HEX, SM PATT, 2-56 X .156 WD	83-9260-2206	2
000106		PAR53	THCMS & BFYS	TERM-LUG, INSUL, R TG, .26WD	83-9630-0203	2
000107		MS35333-42	MIL STD	WASHER-LOCK, FLAT, INT T, #3/8	83-9261-4211	2
000108		M-2766	ALLEN BRADLY	NUT-HEX, PLAIN, 3/8-32 X .500 DD	83-9260-2112	4
000109	1525	23059B027	A MINCOM	ROD-DOOR STOP, SIG ELECT	83-3280-0940	1
000110	1527	23059A014-3	B MINCOM	HINGE-BLTT, CHASSIS HALF	83-3270-0479	1

LAST OF 5 PAGES

M64 PAR 2-71

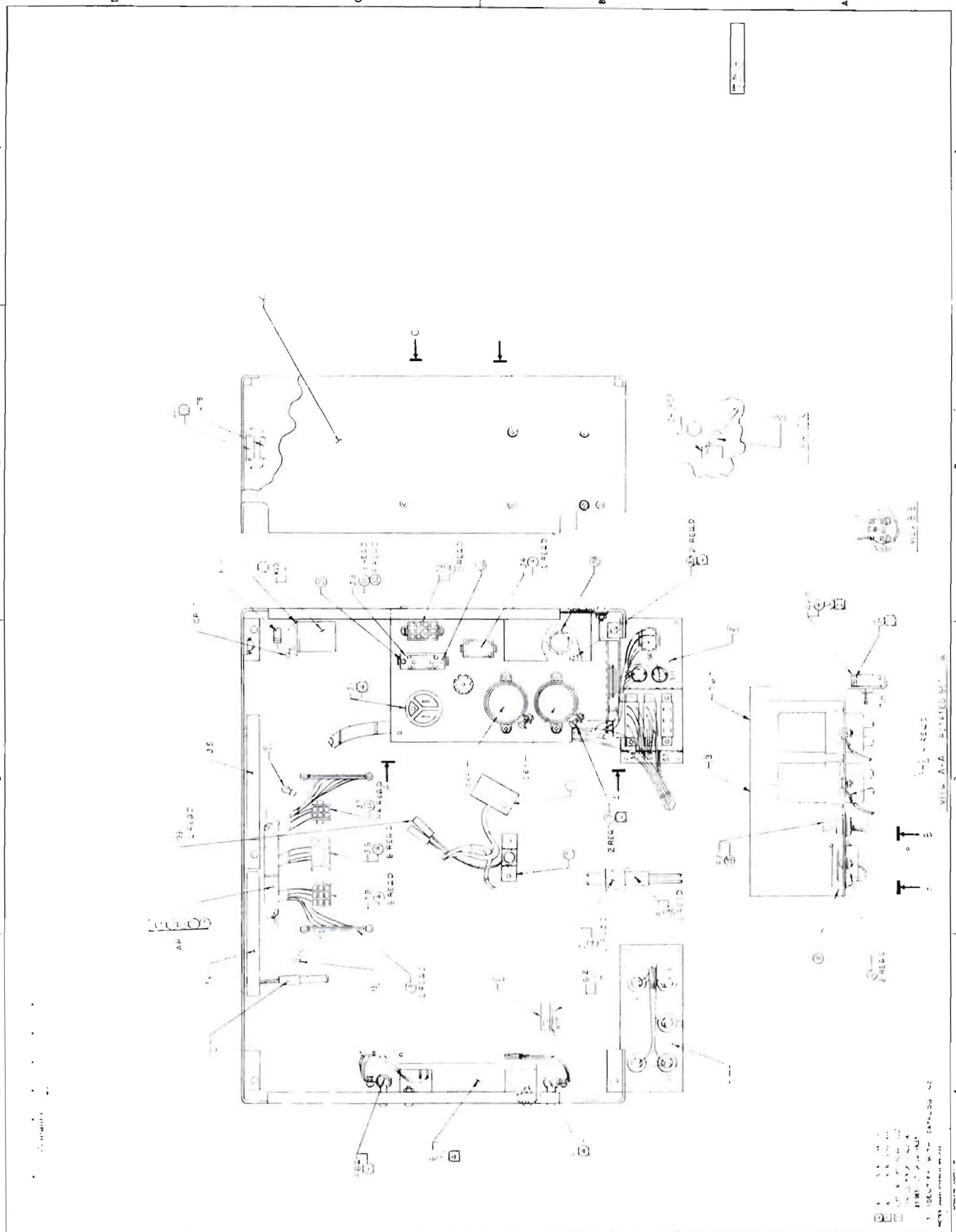
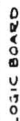
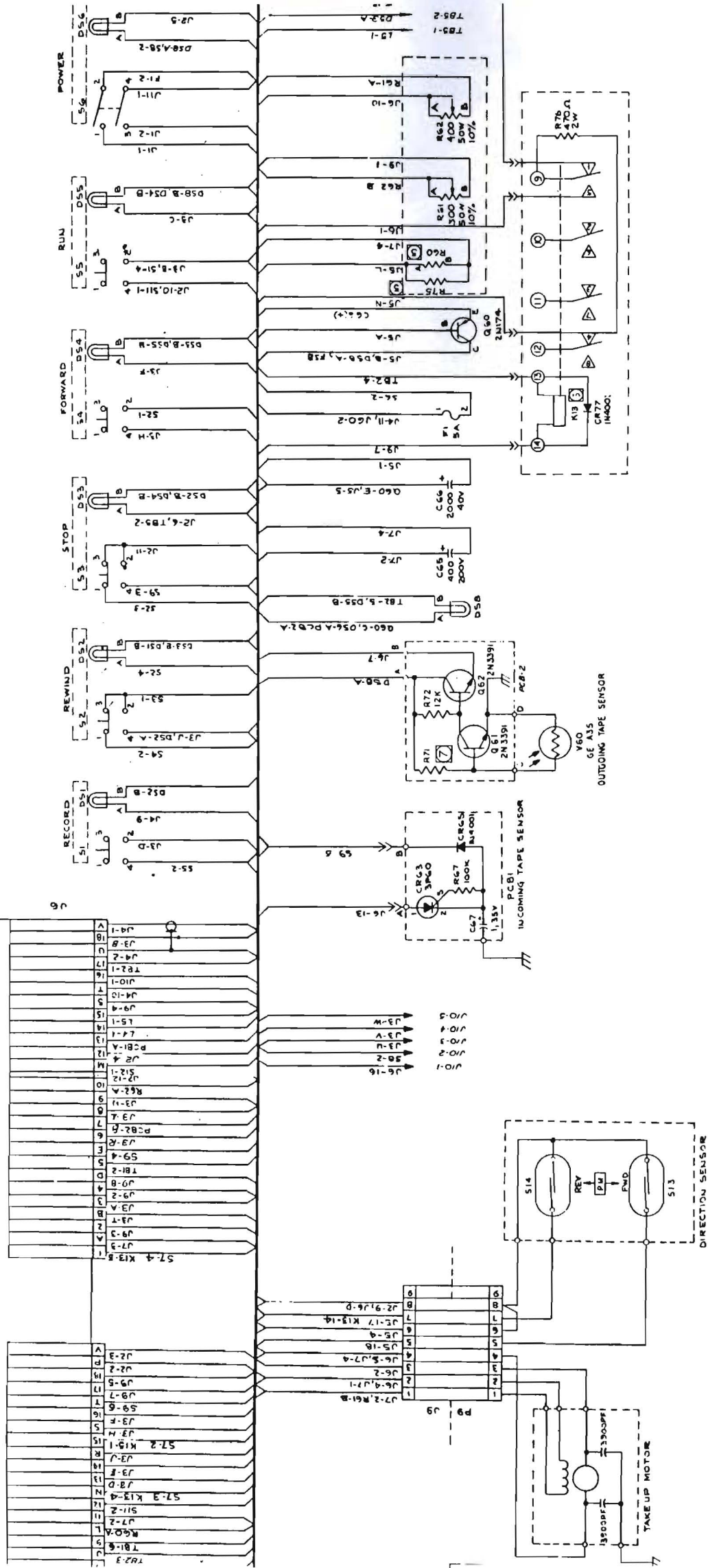


Figure 37. Remote Control Assembly



LOGIC BOARD



99/100
2 of 3

NOTES, UNLESS OTHERWISE SPECIFIED:

1. ALL CAPACITANCE VALUES ARE IN MICROFARADS
2. ALL RESISTANCE VALUES ARE IN OHMS
3. WHEN INSTALLING HARNESS IN M64 MACH. CHANGE AS FOLLOWS FOR PROPER ROTATION OF REEL MOTORS & DIRECTION SENSING:
 - J111 BECOMES J7-1
 - J7-1 BECOMES J111
 - J9-1 BECOMES J9-2
 - J9-2 BECOMES J9-1
 - J9-3 BECOMES J9-4
 - J9-4 BECOMES J9-3

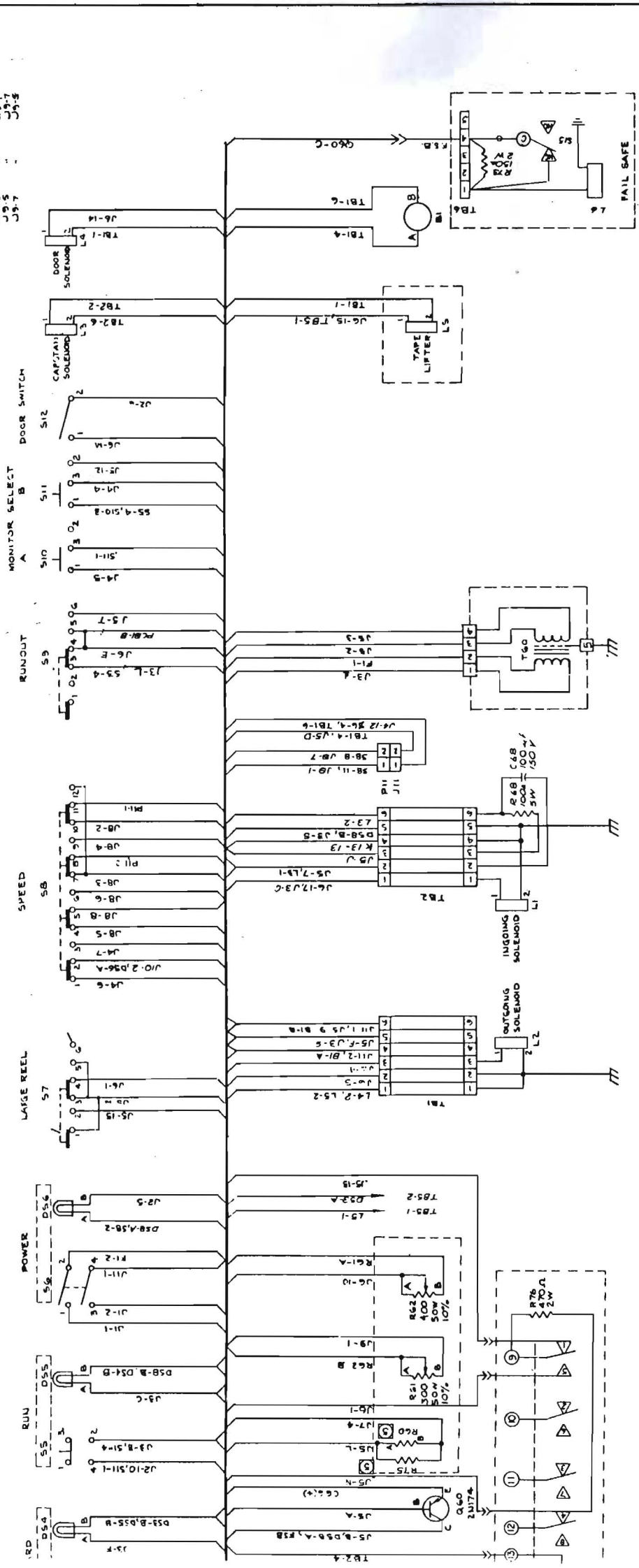
4. FOR ALL 1/4 IN MACHINES

- A. REPLACE R40 BY (000.25W)
- B. INSTALL X13 IN PARALLEL
- C. DETACH ALL WIRE FROM S7
- D. DETACH (M64) AND R78 (TO REM)

COILS	R10	R75	R13
1/4 IN	1000	2000	YES
1/2 IN	150	NONE	NO
3/4 IN	150	NONE	NO
FILM SYNC	150	NONE	NO
ISO MIL	250	500	NO

6. ALL ITEMS ENCLOSED WITHIN DASHED LINES WILL BE ADDED AS REQ'D WHEN THIS SUB-ASSY IS MATED WITH ASSOCIATED ASSEMBLY.

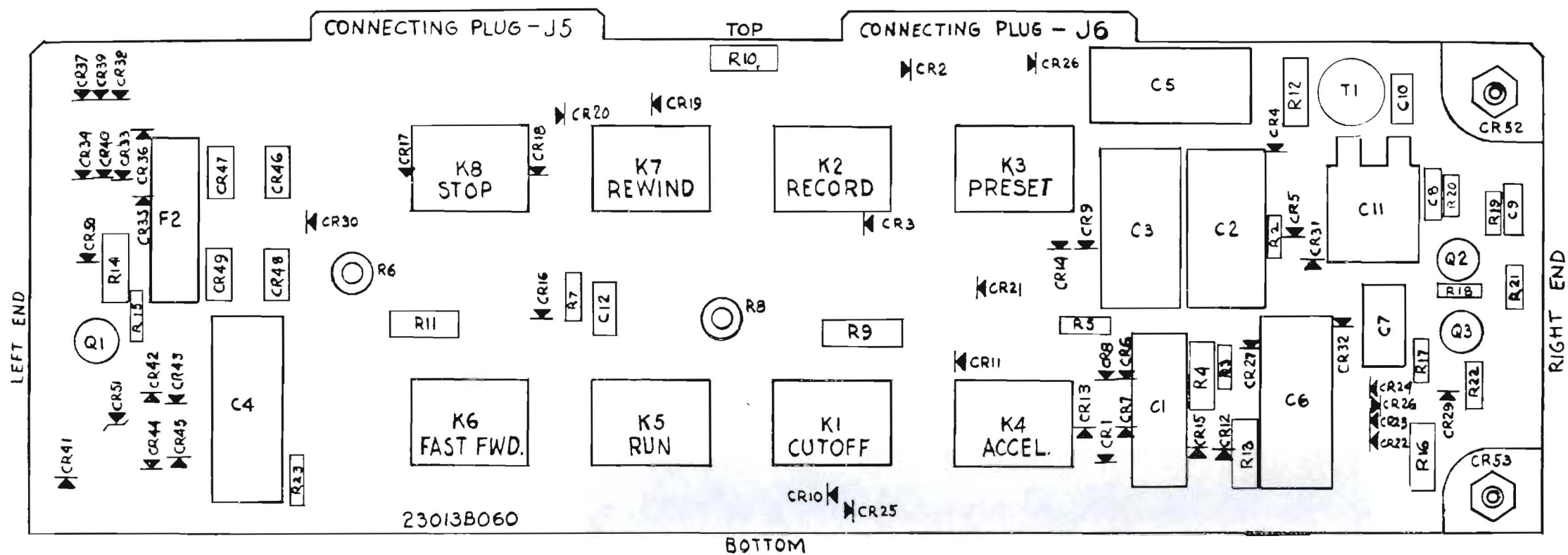
7. VALUE TO BE SELECTED DURING MACHINE TESTING



HARNESS - TAPE TRANSPORT
SCHEMATIC NO. L22018000
REV. 14

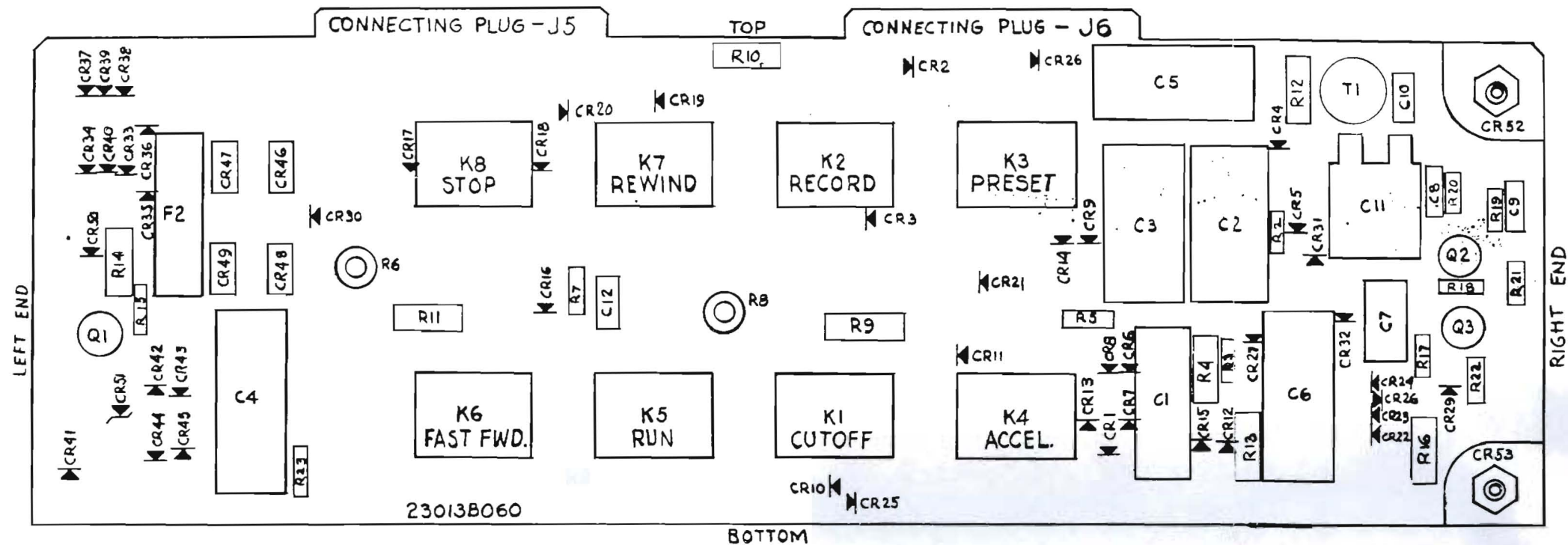
Figure 25. Tape Transport Schematic

M64 PAR 2-71



LAYOUT OF COMPONENTS ON LOGIC BOARD 23013B060
VIEWED FROM COMPONENT SIDE

Figure 26. Tape Transport Circuit Board Layout



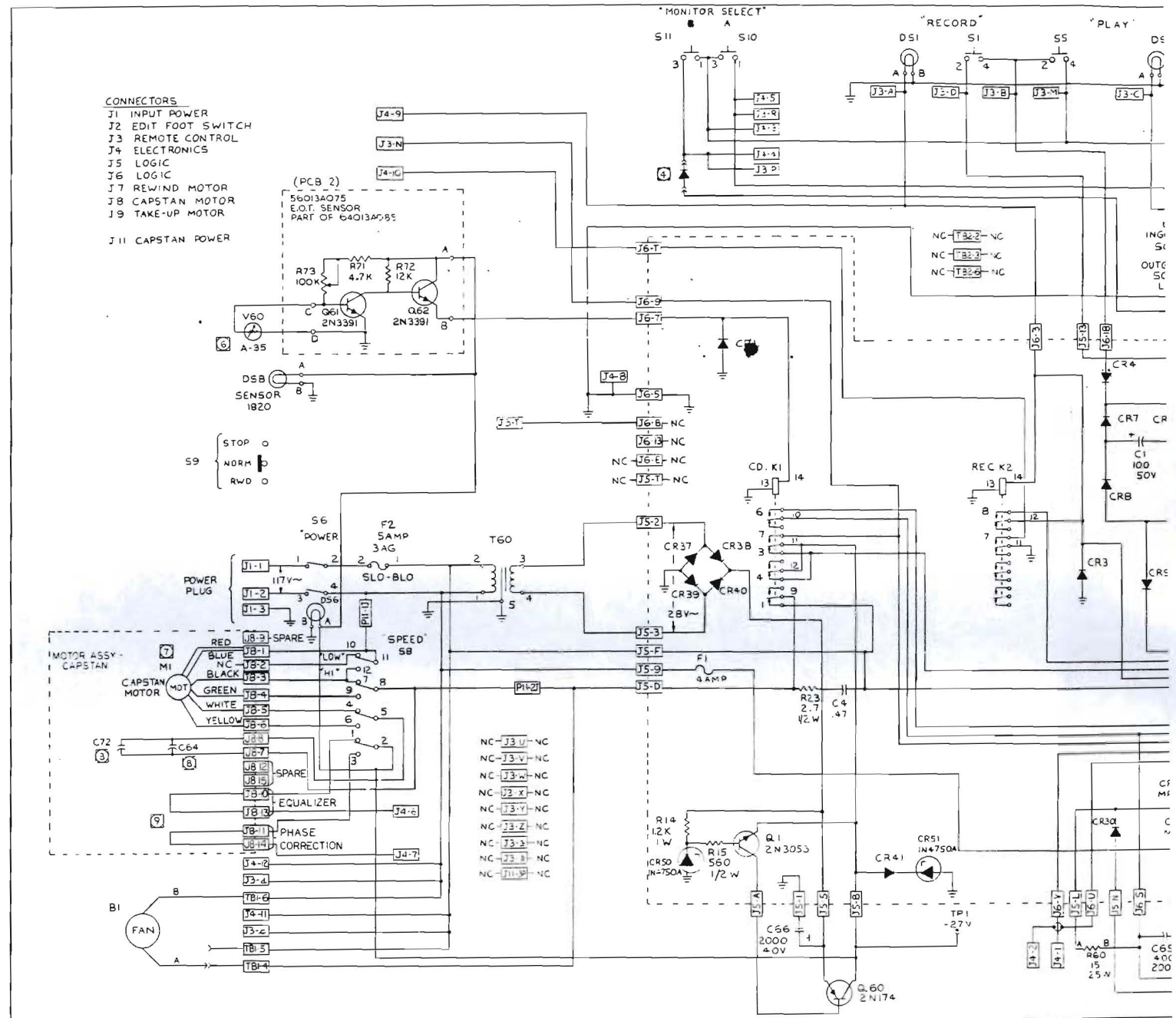
LAYOUT OF COMPONENTS ON LOGIC BOARD 23013B060
VIEWED FROM COMPONENT SIDE

Figure 26. Tape Transport Circuit Board Layout

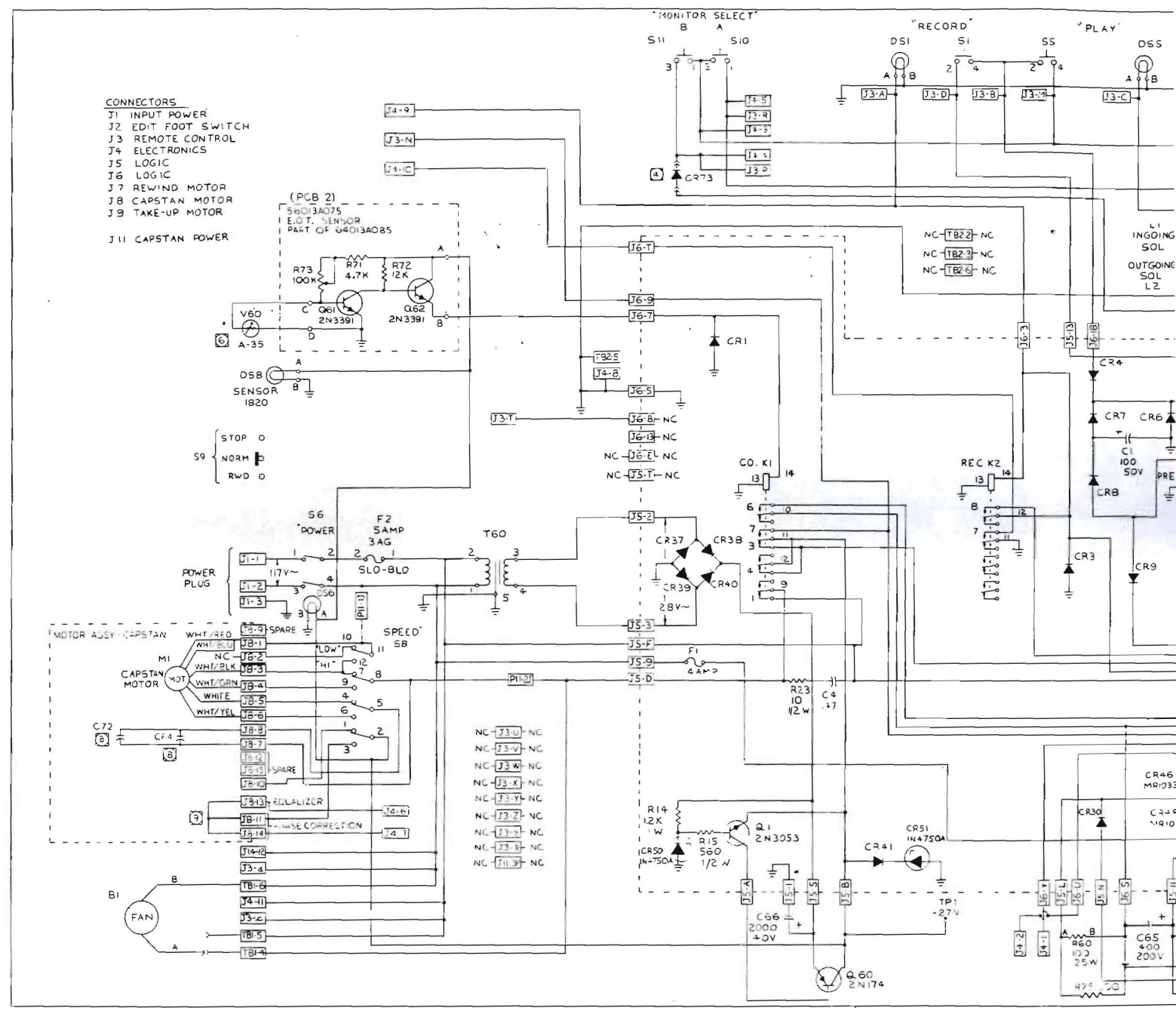
CONNECTORS

J1 INPUT POWER
J2 EDIT FOOT SWITCH
J3 REMOTE CONTROL
J4 ELECTRONICS
J5 LOGIC
J6 LOGIC
J7 REWIND MOTOR
J8 CAPSTAN MOTOR
J9 TAKE-UP MOTOR

J11 CAPSTAN POWER



- CONNECTORS
- J1 INPUT POWER
 - J2 EDIT FOOT SWITCH
 - J3 REMOTE CONTROL
 - J4 ELECTRONICS
 - J5 LOGIC
 - J6 LOGIC
 - J7 REWIND MOTOR
 - J8 CAPSTAN MOTOR
 - J9 TAKE-UP MOTOR
 - J11 CAPSTAN POWER



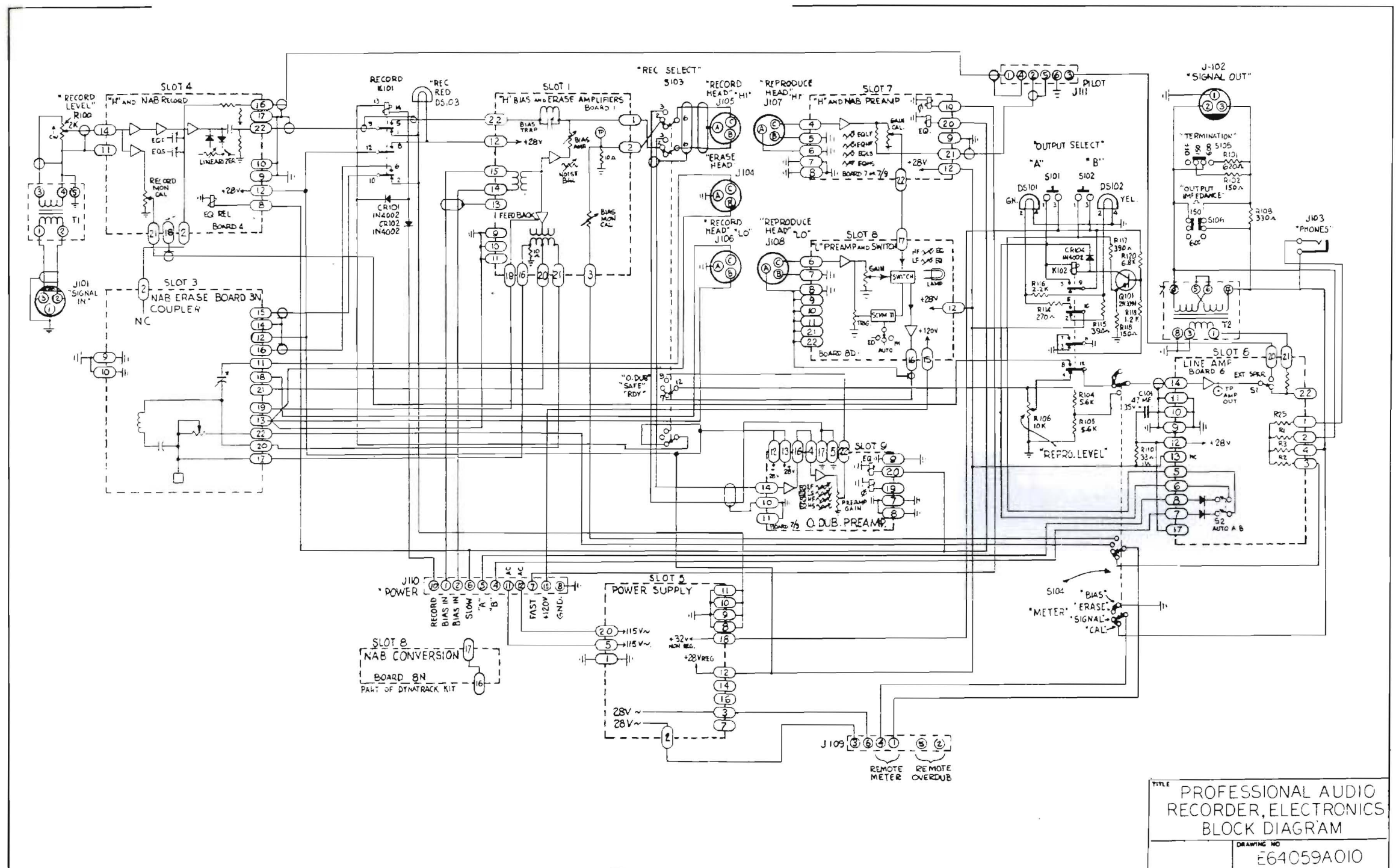


Figure 28. Electronics Block Diagram

Figure 29. Remote Control Assembly Schematic

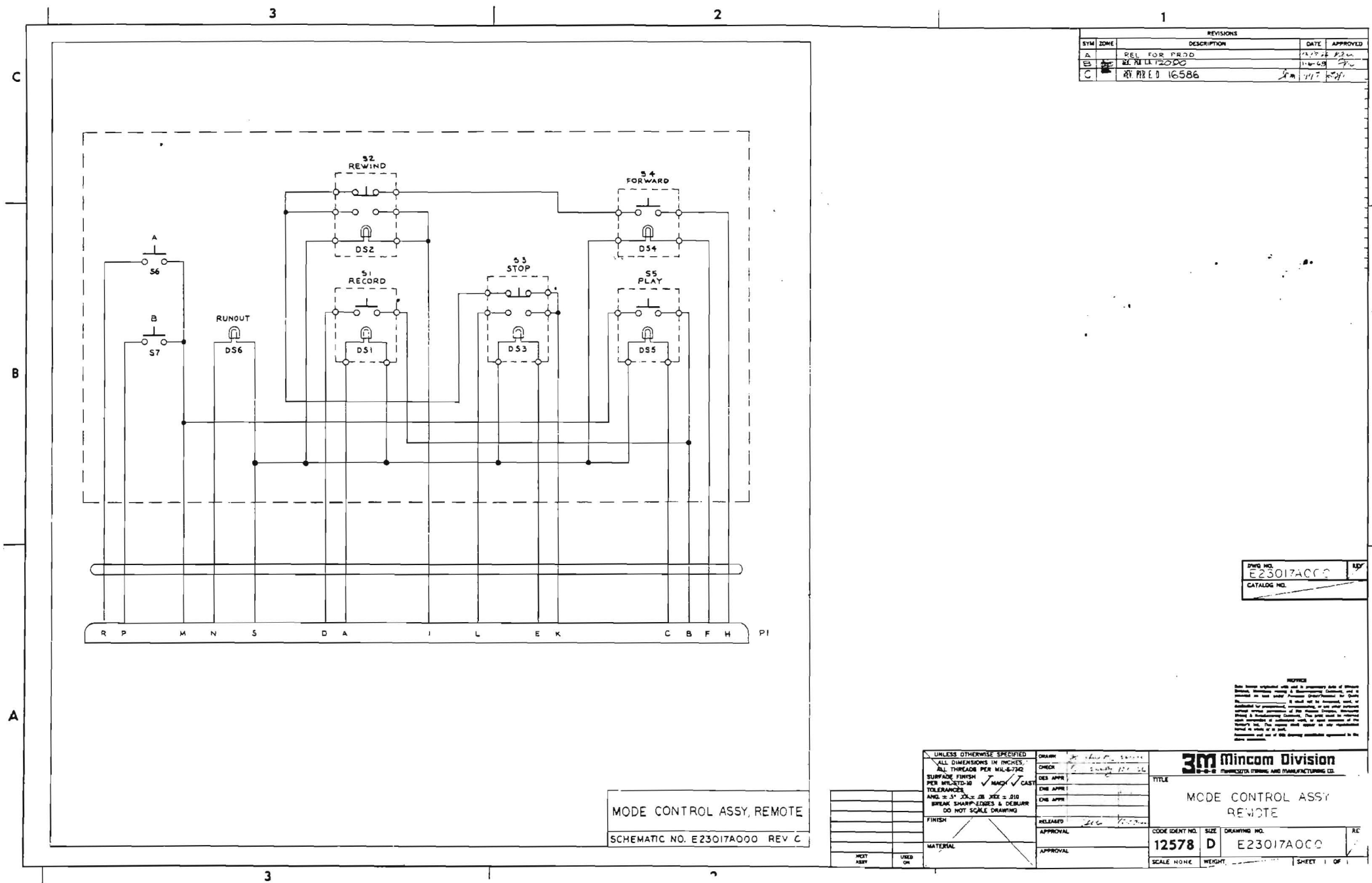


Figure 29. Remote Control Assembly Schematic

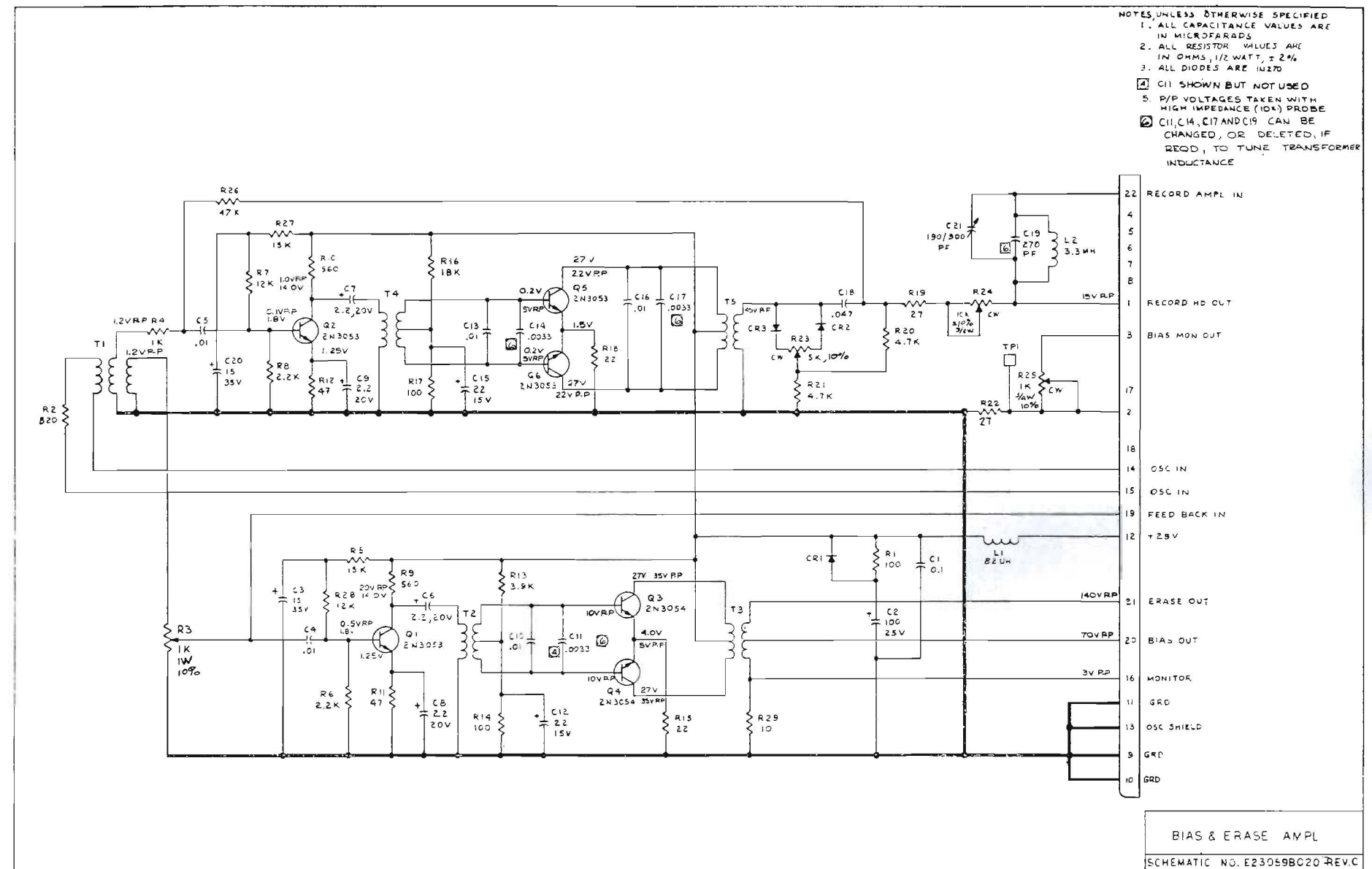


Figure 30. Bias and Erase Amplifier Schematic

BOTTOM
VIEW
2N3054



2N3053

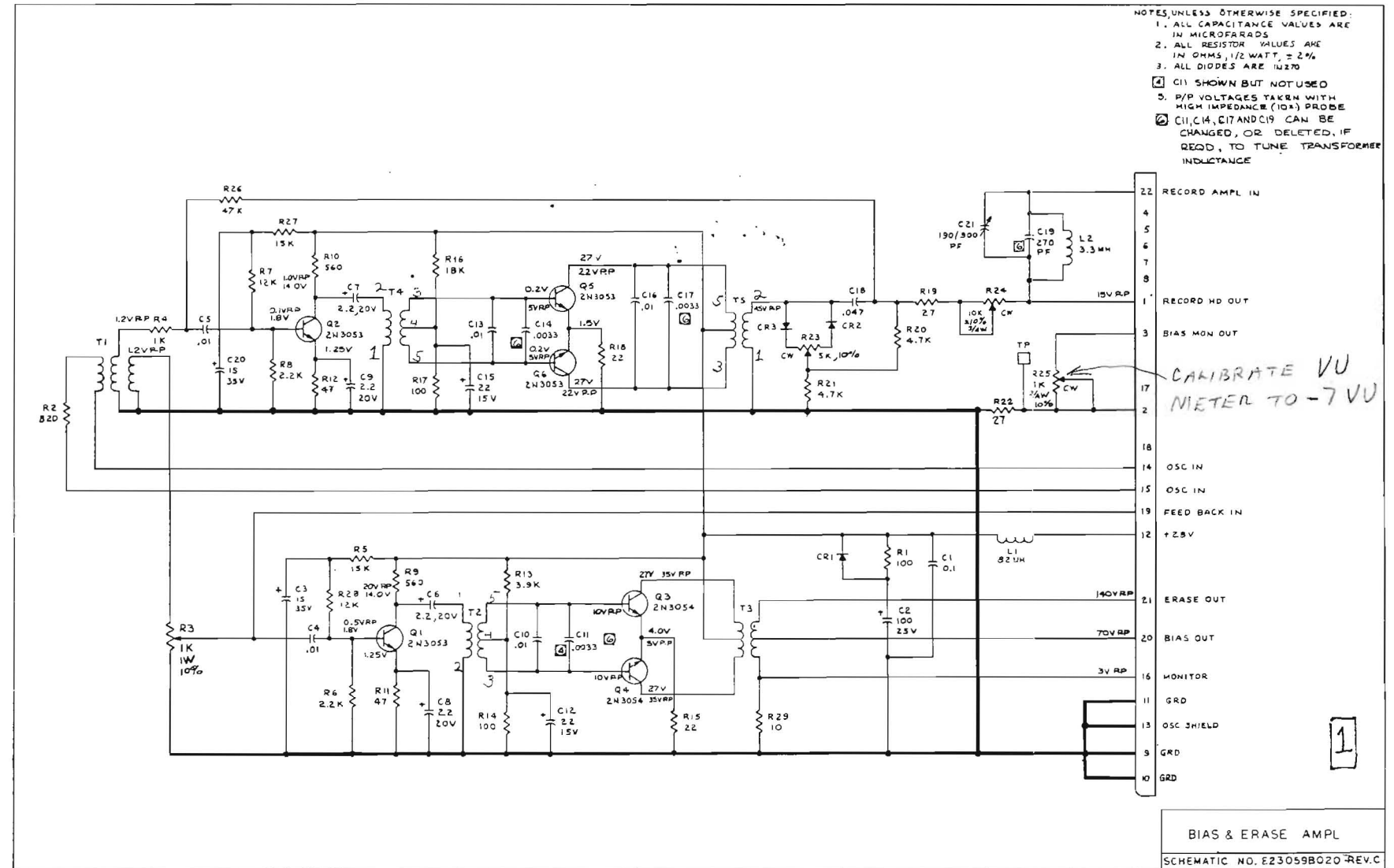
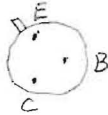


Figure 30. Bias and Erase Amplifier Schematic

3. C16, C20, C21 & R11 ARE NOT
FURNISHED. R11 IS JUMPERED OUT.
4. P/P VOLTS AT OVU 1KC



6. REMAINING 12 RECORDS IN A...

M64 PAR 3-72



113/114

4 R7 & R8 VALUES MAY BE CHANGED IF REQD, TO ADJUST OUTPUT VOLTAGE TO $28.25 \text{ VDC} \pm .25 \text{ VDC}$

REV
C

M64 PAR 3-72

4 R7 & R8 VALUES MAY BE CHANGED
IF REQD, TO ADJUST OUTPUT VOLTAGE
TO 28.25 VDC \pm .25 VDC



SCHEMATIC NO. E64031A000	REV C
--------------------------	----------

M64 PAR 3-72

- NOTES: UNLESS OTHERWISE SPECIFIED
 1. CAPACITANCE VALUES ARE IN MICROFARADS
 2. RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, $\pm 5\%$
 3. ALL DIODES ARE 1N4002
 4. VALUES TO BE SELECTED ON TEST PER TABULATION
 BLOCK AND DWG 000004884.

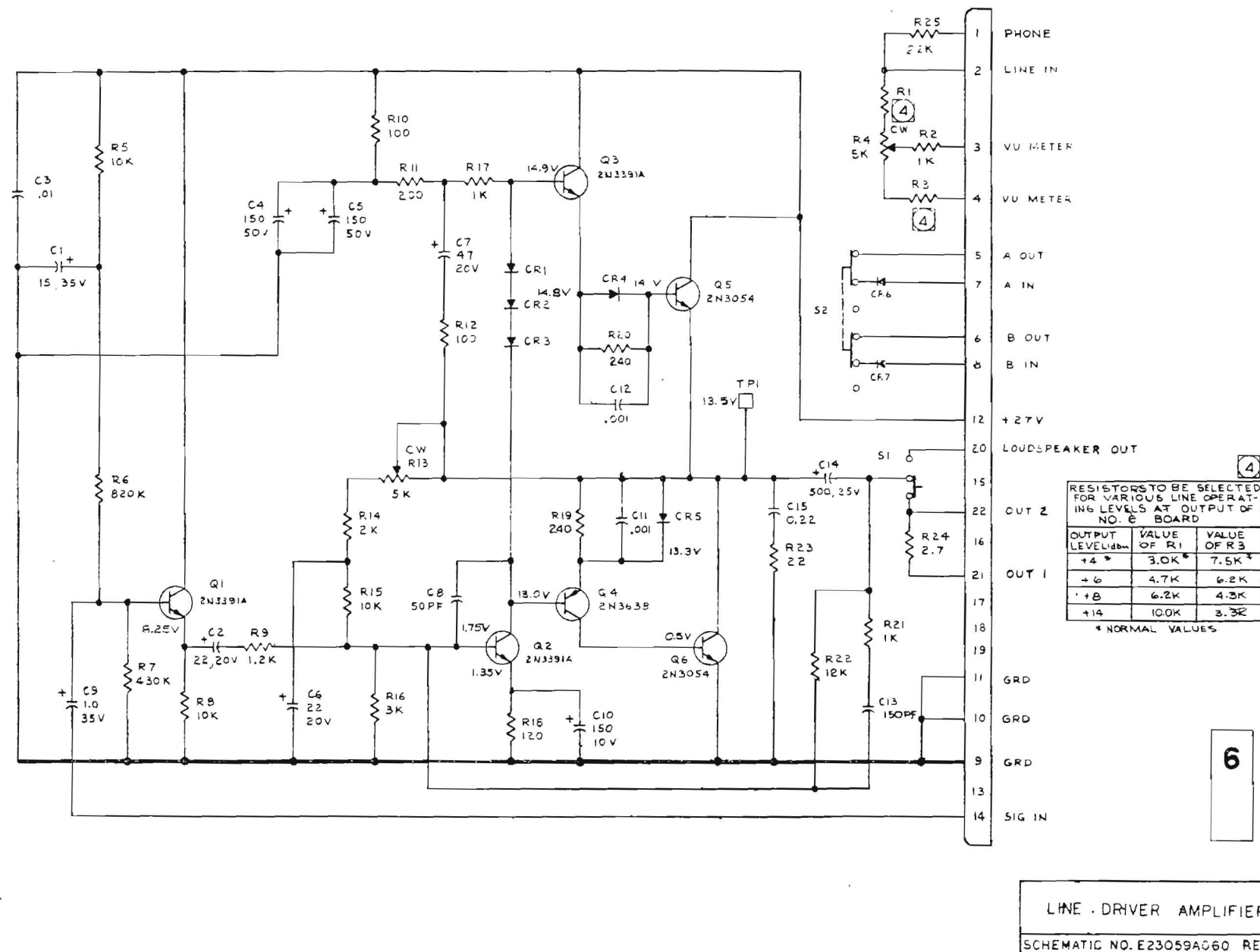


Figure 34. Line Driver Amplifier Schematic
 M64 PAR 3-72

- NOTES: UNLESS OTHERWISE SPECIFIED
 1. CAPACITANCE VALUES ARE IN MICROFARADS
 2. RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, $\pm 5\%$
 3. ALL DIODES ARE IN4002
 4. VALUES TO BE SELECTED ON TEST PER TABULATION
 BLOCK AND DWG 00000A6804.

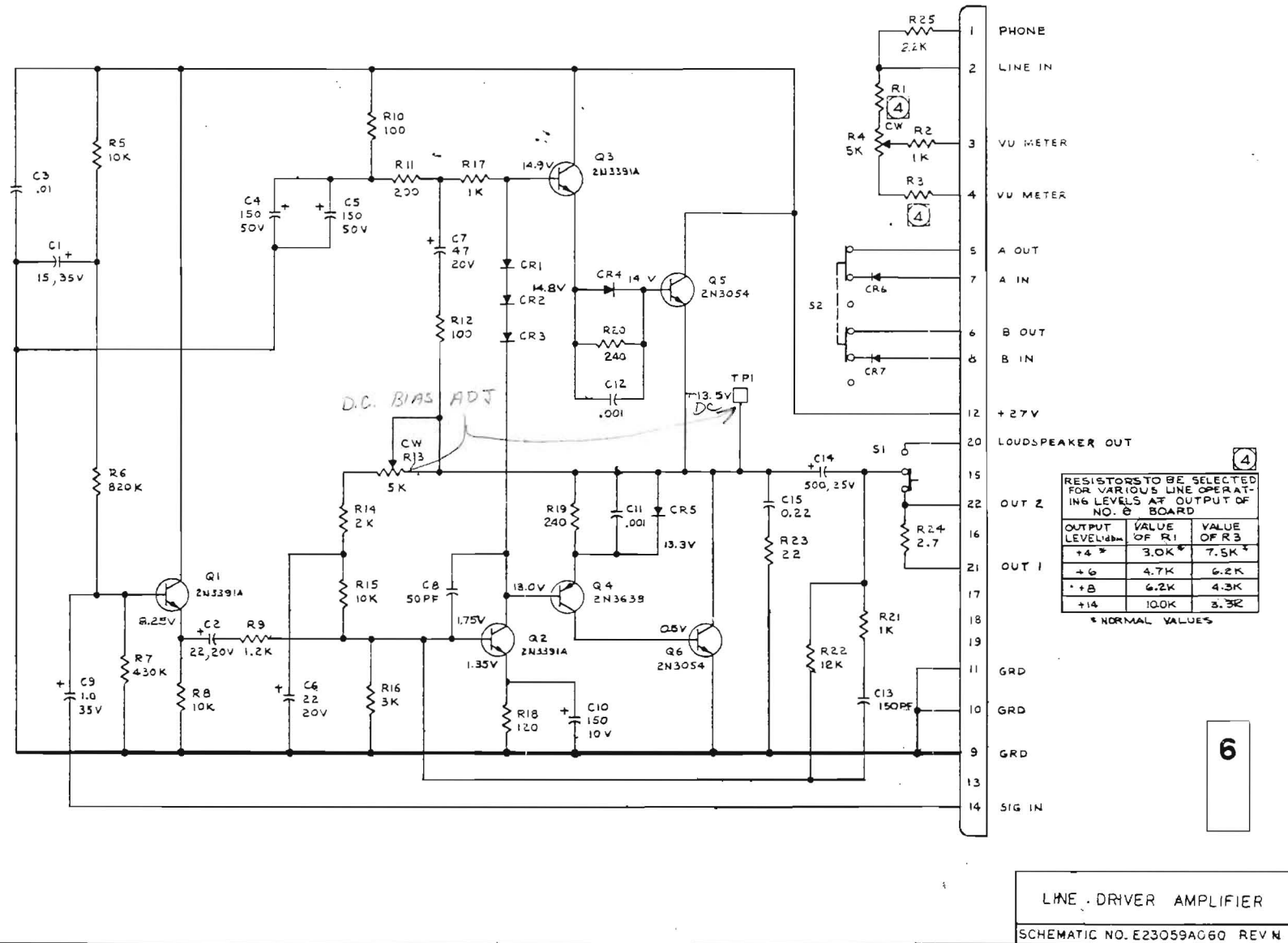
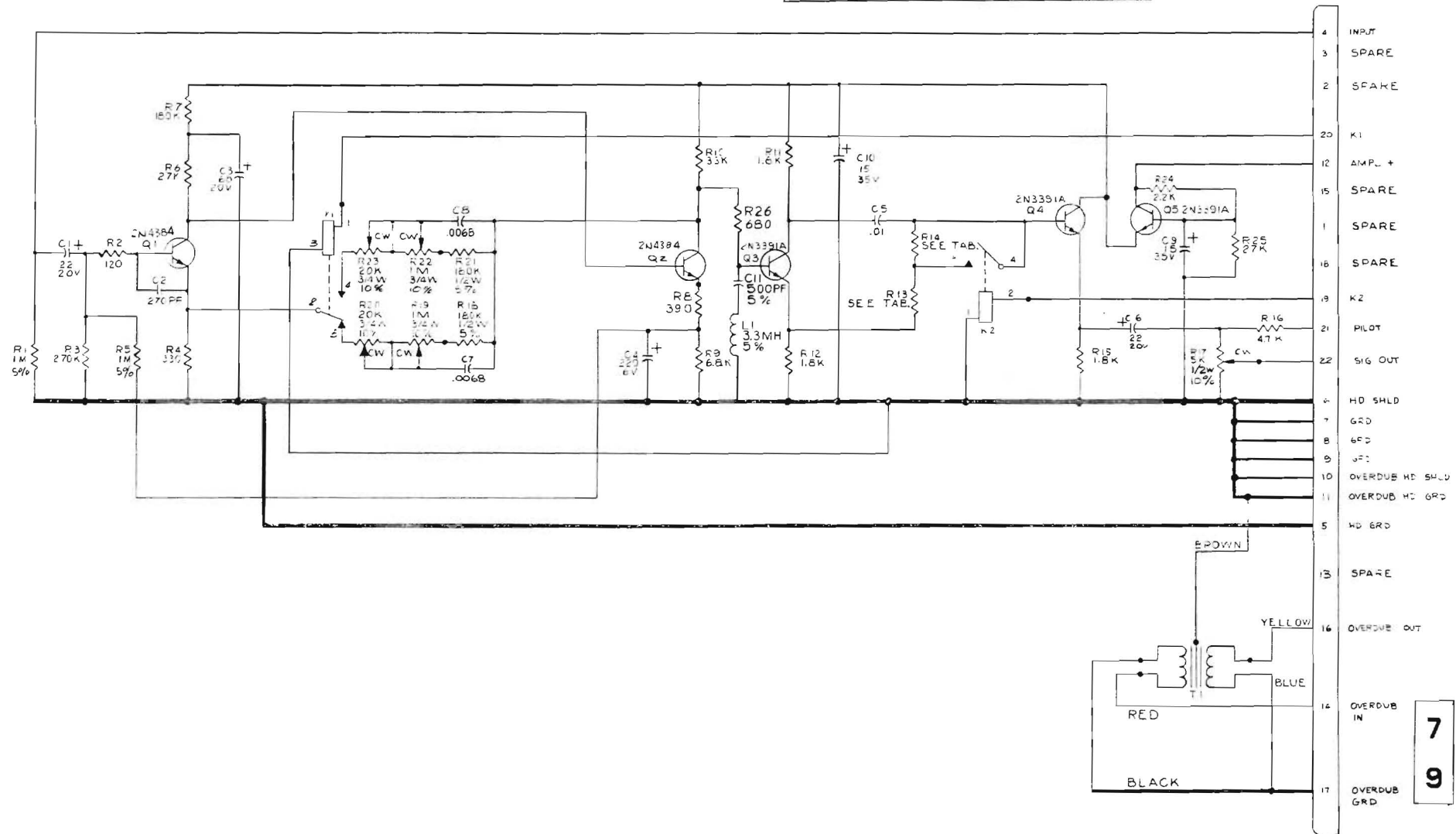


Figure 34. Line Driver Amplifier Schematic
 M64 PAR 3-72

NOTES: UNLESS OTHERWISE SPECIFIED
 1. ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, 2%
 2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.

COMPONENT VALUE TABULATION			
DASH NO.	CAT. NO.	CONFIG	VALUE
-1	83-4930-2180	7.5-151FS	R13 R14
-2	83-4930-2511	15-30 IPS	R10 R10J



PREAMP, OVERDUB
 SCHEMATIC NO. E23059B090 REV H

Figure 35. NAB Preamp with Overdub Schematic

PARTS LISTS

INTRODUCTION

This section contains parts lists for the 3M Brand Professional Audio Recorder. Drawings for mechanical assemblies are included to aid in parts identification. Electrical parts are identified by reference designators on the assemblies of which they are a part.

The parts list are arranged in alphanumerical order according to their part number which is in the upper right corner. When an assembly drawing is included, it follows immediately after the parts list. The top assembly drawing number is different for each recorder. Refer to table 10 for the appropriate top assembly number.

ORDERING REPLACEMENT PARTS

Parts should be ordered through one of the Mincom Division service offices listed below. 3M recommends that whenever possible, and particularly when an instrument is used in a critical application, the user maintains a minimum stock of spare parts. The Mincom Division has specialized personnel ready to assist the user in making a selection of spares. Any additional information required can be obtained by contacting the service offices listed below.

Western U. S. 3M Company
Mincom Division
300 South Lewis Road
Camarillo, California 93010
(805) 482-1911

Eastern U. S. 3M Company
Mincom Division
4701 Lydell Avenue
Cheverly Industrial Center
Cheverly, Maryland 20781
(301) 773-5050

When ordering parts the following information should always be supplied:

1. A description of the part, obtained from the parts list.
2. The 3M catalog number.
3. The manufacturer's part number.
4. The schematic reference designator, if applicable, given on the applicable schematic and on the parts list.

5. The part or type number of the major assembly as shown on the nameplate, and the serial number of that assembly.
6. The 3M sales order number applying to the complete system or order.

The following table lists each of the parts lists included in this manual. To locate a parts list, determine the part number or assembly name and locate it in the following table. The referenced page number may then be used to find the parts list.

Table 10. Parts List Index

Part No.	Description	Catalog No.	Page
23000A010-1	Interconnecting Cable Assembly	83-4570-0382	124
23000A010-4	Interconnecting Cable Assembly	83-4570-0385	125
23000B020-2	Head Set Assembly-Rec/Rep/Erase, 2 Track	83-5950-1228	126
23000B020-4	Head Set Assembly-Rec/Rep/Erase, 4 Track	83-5950-1230	127
23000A951	Foot Switch Chassis Assembly	83-3310-1135	128
23004B000	Takeup Reel Motor Assembly	83-4560-0090	129
23004A050	Reel Motor Rewind Assembly	83-4560-0092	130
23004C010-5	15-30 IPS 50 Cycle Capstan Motor Assembly	83-4560-0159	131
23007A020-1	Idler Assembly, Reversing 1/2 Inch	83-4340-0318	132
23007A030-1	Tape Transport Head Cover Door Assembly	83-4330-0241	133
23007A040-1	Incoming Actuating Idler Arm Assembly	83-4340-0310	134
23007A040-2	Outgoing Actuating Idler Arm Assembly	83-4240-0311	135
23007A060-1	1/2" Tape Transport Capstan Assembly	83-5920-0819	136
23013A090-1	Left Hand Roller Idler Arm Assembly	83-4210-0230	137
23013A090-2	Right Hand Roller Idler Arm Assembly	83-4210-0231	138
23013A095	Head Cover Door Actuator Arm Assembly	83-4210-0237	139
23017A000	Optional Remote Control Assembly	83-5920-0823	140
23028A050	Cable Assembly, 36" 4 Track Power	83-4570-0346	142
23059B020	Bias Erase Printed Circuit Board Assembly	83-4930-2952	143
23059B030	NAB Erase Coupler Printed Circuit Board Assy	83-4930-2961	145
23059B040	NAB Record Printed Circuit Board Assembly	83-4930-1214	146
23059A060	Signal Electronics Line Amplifier Printed Circuit Board Assembly	83-4930-1091	148
23059B090-1	Overdub Preamplifier Printed Circuit Board Assembly, 7.5/15 IPS	83-4930-2180	150
23059B090-2	Overdub Preamplifier Printed Circuit Board Assembly, 15/30 IPS	83-4930-2511	152
23059A110	Extender Printed Circuit Board Assembly	83-4930-1746	153
56007A060-1	Motor Assembly - 7 1/2-15 ips 60 Hz	83-4560-0225	154
56007A060-2	Motor Assembly - 7 1/2-15 ips 50 Hz	83-4560-0227	155
56007B065-1	Motor Assy - Capstan 15-30 ips 60 Hz	83-4560-0283	156
56007B065-2	Motor Assy - Capstan 15-30 ips 50 Hz	83-4560-0284	157

Table 10. Parts List Index (Cont.)

Part No.	Description	Catalog No.	Page
64000A001	M64 Assy, 1/2" 4 Track, 7.5-15 ips 60 Hz	83-5996-4000	158
64000A002	M64 Assy, 1/2" 4 Track, 15-30 ips 60 Hz	83-5996-4001	175
64000A003	M64 Assy, 1/2" 4 Track 7.5-15 ips 50 Hz	83-5996-4002	176
64000A004	M64 Assy, 1/2" 4 Track 15-30 ips 50 Hz	83-5996-4003	
64000A005	M64 Assy, 1/4" 2 Track 7.5-15 ips 60 Hz	83-5996-4004	178
64000A006	M64 Assy, 1/4" 2 Track 15-30 ips 60 Hz	83-5996-4005	179
64000A007	M64 Assy, 1/4" 2 Track 7.5-15 ips 50 Hz	83-5996-4006	180
64000A008	M64 Assy, 1/4" 2 Track 15-30 ips 50 Hz	83-5996-4007	181
64013A060	PC Board Assembly - Logic Transport	83-4930-3065	182
64013A080	Chassis Assembly, Transport Elec. 1/4"	83-5920-1856	185
64013A085	Chassis Assembly, Transport Elec. 1/2"	83-5920-1857	191
64028A020-1	Cable Assy - Meter Display 4 Track	83-4570-0805	192
64028A020-2	Cable Assy - Meter Display 2 Track	83-4570-0806	193
64028A040	Cable Assembly - Stepdown Trans. 4 Track	83-4570-0803	194
64031A000-1	Power Supply-Elect. 4 Track	83-5920-1821	195
64031A000-2	Power Supply - Elect. 2 Track	83-5920-1822	197
64059A010	Housing Assembly Signal Electronics	83-4930-2980	199

MFG PARTS LIST

TITLE CABLE ASSY-INTERCONN,FD,1 TRK		CATALOG NO. 83-457C-0382		PL 23000A010-1		REV	
REF.DES./FIND #	---EFF--- REG. END.	DRAWING NUMBER - MFGR PART NO.	MFGR NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.	
000001		MRAC42S-G7	WINCHESTER	CONN-RECP, RECTANGLR, 42 CON	83-1610-0817	1	
000002		100-2020S	WINCHESTER	SOCKET-CCN, CONN., .766 LG, 20 GA	83-1610-0818	1	
000003		23000A011	B MINCOM	BRKT MTC-HEAD CONNECTOR	83-3320-1468	2	
000004		00000A499-57	LLOYD WEST C	MARKER-IDENT, CABLE, UNMARKED	83-3550-1271	3	
000005		23000A015	MINCOM	CABLE ASSY-INTERCONN, HDS	83-4570-0345	1	
000006			NATL WIRE	WIRE-TYPE B, 22GA BLU NYLON JKT	83-7910-0044	AR	
000007		TYPE YQE-91	BURNDY	SPLICE-ELECTRICAL CONDUCTOR	83-9630-0470	1	

LAST OF 2 PAGES

M E G P A R T S L I S T

TITLE	CABLE ASSY-INTERCCNN,HDS,4 TRK	CATALOG NO.	83-457C-C385	PL	23000A010-4	REV
REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MFCR NAME	D E S C R I P T I O N		PH CATALOG NUMBER QTY.
	REF. END.	- MFCR PART NO.				
000001		MRAC42S-G7	WINCHESTER	CONN-RECP,RECTANGLR,42 CON		83-1610-0817 1
000002		100-2020S	WINCHESTER	SOCKET-CCN,CCNN,.766 LG,20 GA		83-1610-0818 1
000003		23000A011	B MINCOM	BRKT MTC-HEAD CONNECTOR		83-3320-1468 2
000004		00000A499-57	LLOYD WEST C	MARKER-IDENT,CABLE,UNMARKED		83-3550-1271 12
000005		23000A015	MINCOM	CABLE ASSY-INTERCCNN,HDS		83-4570-0345 4
000006			NATL WIRE	WIRE-TYPE B,22GA BLU NYLON JKT		83-7910-0044 AR
000007		TYPE YQF-S1	BLRNDY	SPLICE-ELECTRICAL CCNDUCTOR		83-9630-0470 1

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE HD SET ASSY-REC/REP/FRASE,2 TK

CATALOG NO. 83-595C-1228

PL 23000B020-2

REV E

REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	REF. FND.	- MEGR PART NO.				
000004		23002A001-1	C MINCOM	SHIELD-HEAD, REPRODUCE	83-3950-1105	1
000006		23001B010-1	MINCOM	MTG PLATE ASSY-REC/REP, 1/2 IN	83-5950-1236	1
000007	1548	23001AC60	R MINCOM	FINAL HC ASSY-2TK, REC AUD 1/4	83-4950-1454	1
000008	1548	23002AC50	C MINCOM	FINAL HC ASSY-2TK REP AUD 1/4	83-4950-1455	1
000009	1548	23101AC60	B MINCOM	FINAL PC ASSY-2TK FRASE AUD 1/4	83-4950-1456	1
000010		MS35206-204	MIL STD	SCREW-MACH, PAN HD, 2-56 X 5/16	83-9260-4503	4
000011		MS35206-205	MIL STD	SCREW-MACH, PAN HD, 2-56 X 3/8	83-9260-4504	2
000013				WASHER-FLAT, SM PATT, #2	83-9261-4011	6
000016		MS35338-39	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #2	83-9261-4301	6
000017		100-2020P	WINCHESTER	PIN-CONTACT, CONN, .040 DIA X.766	83-1610-0918	11

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE		HD SET ASSY-REC/REP/ERASE,4 TK		CATALOG NO.	83-5950-1230	PL	230008020-4	REV	E
REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER		QTY.	
	BEG. END.	- MEGR PART NO.							
000004		23002A001-1	C MINCOM	SHIFLD-HEAD, REPRODUCE		83-3950-1105		1	
000006		230018010-1	MINCOM	MTG PLATE ASSY-REC/REP,1/2 IN		83-5950-1236		1	
000007	1548	23001A020	C MINCOM	FINAL HC ASSY-4TCK,REC, PAR		83-4950-1356		1	
000008	1548	23002A110	B MINCOM	FINAL HC ASSY-4 TK,1/2, REP		83-4950-1294		1	
000009	1548	23101A050	B MINCOM	FINAL HC ASSY-4TCK,ERASE PAR		83-4950-1410		1	
000010		MS35206-204	MIL STD	SCREW-MACH,PAN HD,2-56 X 5/16		83-9260-4503		4	
000011		MS35206-205	MIL STD	SCREW-MACH, PAN HD,2-56 X 3/8		83-9260-4504		2	
000013				WASHER-FLAT,SM PATT,#2		83-9261-4011		6	
000016		MS35338-39	MIL STD	WASHER-LOCK,SPLIT,HFICAL,#2		83-9261-4301		6	
000017		100-2020P	WINCHESTER	PIN-CONTACT,CONN,.040DIA X.766		83-1610-0918		21	

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CHASSIS-SWITCH ASSY, FCCT

CATALOG NO. 83-3310-1135

PL 23000A951

REV A

REF. DES. / FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	DESCRIPTION	PP CATALOG NUMBER	QTY.
REF. END.		- MEGR PART NO.				

000001
000002FF-832
1591BPFNN ENGRNG NUT-CLINCH, SELF LOCK, 8-32UNC
USECO FASTENER-CHAS, TAP, 4-40 X .10583-9264-0431
83-9262-0265

3

4

LAST OF 2 PAGES

M E G P A R T S L I S T

TITLE MOTOR ASSY-TAKE UP REEL CATALOG NO. 83-4560-0237 PL 230048000 REV B

REF.DES./FIND # ---DEF--- DRAWING NUMBER MGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
 REG. END. - MGR PART NO.

PO	1-480277-C	AMP INC	SHELL-CAN,RECT, .850 WD X.905	83-1610-0930	1
000001	LESS-10-1/3	MIN PREC BRG	BRG-BALL,ANLR,PLAIN, .625 BORE	83-1230-0331	1
000002	40618-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA	83-1610-0925	4
000003	23004A004	R MINCOM	ADAPTER-REEL HUB,REWIND MOTOR	83-3240-0303	1
000004	23004A003	A MINCOM	PLATE-MTG,TAKE UP & REWIND MOT	83-3320-1105	1
000005	56004A106	R MINCOM	TERM-LUG, MOD	83-3630-0600	2
000006	56004A105	A MINCOM	INDICATOR-FLAG, DIR SENSOR	83-3550-1825	1
000007	23004A005	A MINCOM	MOTOR-TAKE UP & REWIND,REEL	83-3560-0091	1
000008	56004A020	R MINCOM	PC BD ASSY-DIRECTION SENSOR	83-4930-2825	1
000009	MS35206-231	MIL STD	SCREW-MACH,PAN HD,6-32 X 5/8	83-9260-4535	2
000010	MS24602-S272	MIL STD	SCREW-MACH,FH,10-32 X 1/2	83-9260-6294	4
000011	MS51017-25	MIL STD	SETSCREW-CUP PT,8-32 X 1/4	83-9261-0069	3
000012	MS27183-6	MIL STD	WASHER-FLAT,GENERAL PURPOSE,#6	83-9261-4004	AR
000013	MS35239-41	MIL STD	WASHER-LOCK,SPLIT, #6	83-9261-4305	AR
000014	H-31	HAMLIN	MAGNET-PERMANENT, BAR,600-800	83-1190-0061	1
000015			NUT-HEX,SM PATT,6-32 X .250 WD	83-9260-2202	2
000016	4772	HH SMITH	CLAMP-STRAIN, .188 ID	83-7650-0101	1

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE MOTOR ASSY-REWIND, REEL

CATALOG NO. 83-4560-0092

PL 23004A050

REV B

REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
REG. FND.		- MEGR PART NO.				
000001		60618-4	AMP INC	CONTACT-ELEC, PIN, .084 DIA	83-1610-0925	4
000002		1-480276-0	AMP INC	SHELL-CAN, RECT, .665 WD X.85C	83-1610-0929	1
000003		23004A004	R MINCOM	ADAPTER-REEL HUB, REWIND MOTOR	83-3240-0303	1
000004		23004A003	A MINCOM	PLATE-MTG, TAKE UP & REWIND MOT	83-3320-1105	1
000005		23004A005	A MINCOM	MOTOR-TAKE UP & REWIND, REEL	83-3560-0091	1
000006		MS24693-S272	MIL STD	SCREW-MACH, FH, 10-32 X 1/2	83-9260-6294	4
000007		MS51017-35	MIL STD	SETSCREW-CUP PT, R-32 X 1/4	83-9261-0069	3
000008		23013A063-1	A MINCOM	SPG-FXPAN, RET, CAPSTAN, 1.810 LG	83-3280-0524	1
000009		7166	WALSCO	TERM-LUG, UNINS, FLAT, #6	83-9630-0028	4

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE MOTOP ASSY-CAPSTAN,15-30,50 CY CATALOG NO. 83-4560-C159 PL 23007C010-5 REV H
 REF.DES./FIND # ---EFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
 BFG. END. - MFGR PART NO.

C64	DP570	SPRAGUE	CAP-FXD,ELEC,5 MF 370VAC 10%	83-1510-2243	1
P8	1-480277-0	AMP INC	SHELL-CCNN,RECT, .850 WD X.905	83-1610-0930	1
R63	0367	OHMITE	RES-ADJ, WW, 75 OHM 25W 10%	83-1520-8306	1
000001	302C920P117	G.E.	RETAINER-CAP,FCOTED,2.625 HT	83-1650-0627	2
000002	MS35206-289	MIL STANDARD	SCREW-MACH,PAN HD,1/4-20 X 2.5	83-9260-4583	1
000003	NAS620-416	NAS STD	WASHER-FLAT,SM PATT,#1/4	83-9261-4043	1
000004	MS35338-44	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#1/4	83-9261-4309	1
000005	2154	H.H. SMITH	INSULATOR-WASH, FIBER,.250 ID	83-9630-0046	2
000006			SCREW-MACH,PAN HD,8-32 X 9/16	83-9260-4552	2
000007	23007A017	D MINCOM	BRACKET-CAPACITOR MTG	83-3320-1582	1
000008	MS35206-261	MIL STD	SCR-MACH,PAN HD,10-24 X 3/8 LG	83-9260-4588	3
000009	MS27183-8	MIL STD	WASHER-FLAT,GENERAL PURPOSE,#10	83-9261-4006	3
000010	MS35338-43	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#10	83-9261-4307	3
000011	6061R-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA	83-1610-0925	8
000012	6128	LERCO	TERMINAL-INSUL,.250 OD,4-40	83-9630-0137	1
000013	23007AC15-6	E MINCOM	PULLEY-CAPSTAN DRIVE,1.503 DIA	83-3220-0191	1
000014	23007A011-3	MINCOM SPEC	MOTOR-CAPSTAN DRIVE,	83-1560-0156	1
000015	NS001-31	TRUARC	RING-RETNG,INT, .346 OD	83-7270-0598	1
000016	MS35206-245	MIL STD	SCREW-MACH,PAN HD,8-32 X 1/2	83-9260-4551	1
000017	MS35338-42	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#8	83-9261-4020	1
000018	MS27183-7	MIL STD	WASHER-FLAT,PD,#8,GEN PURPOSE	83-9261-4038	1
000019	MS35449-42	MIL STD	NUT-HEX,PLAIN,4-40 X .250 WD	83-9260-2003	1
000020	MS35338-40	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#4	83-9261-4303	1
000021	MS27183-4	MIL STD	WASHER-FLAT,GENERAL PURPOSE #4	83-9261-4002	1

LAST OF 2 PAGES

M64 PAR 2-71

PAGE NO. 2

M E G P A R T S L I S T

02/16/71

132

TITLE IDLER ASSY-REVERSING, 1/2 INCH

CATALOG NO. 83-4240-0318

PI 23007A020-1

REV K

REF. DES. / END #	---EEF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PI CATALOG NUMBER	QTY.
REQ. END.		- MEGR PART NO.				
000001		SEE DESC	S	MIN PREC BRG BRG-SR4FRHH7P25-LG20-ZD-1-1	83-1230-0204	2
000002		2-16-EE40-8		PARKER SEAL PKG-PREFORM, .750 OD	83-1290-0130	1
000003		23007A024-1		MINCOM SPACER-BEARING, REV IDLR, .33 LG	83-3230-0307	1
000004		23007A021-1	C	MINCOM IDLER-REVERSING, 1/2 INCH TAPE	83-3240-0320	1
000005		23007A022-1		MINCOM BASE-MTG, REVERSING IDLER, 1/2 IN	83-3240-0321	1
000006	417	23007A023-3	C	MINCOM CAP-IDLER, REVERSING	83-3250-0141	1
000007		102206204		LONG-LOK SCREW-SELF LKG, 6-32 X 1/4	83-9260-0165	1
000008				WASHER-FLAT, SM PATT, #6	83-9261-4013	1

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE DOOR ASSY-HEAD COVER,TPF TRANS

CATALOG NO. 83-4330-0241

PL 23007A030-1

REV D

REF.DES./FIND # ---FFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
REF. END. - MFGR PART NO.

000002	23007A032	B MINCOM	SHAFT-ACTUATING,DOOR,HEAD COVR	83-3280-0406	1
000003	23007C034-1	A MINCOM	DOOR-HEAD COVER	83-3330-0436	1
000004	23007A033	A MINCOM	SUPPORT-DOOR,HD CVR,TAPE TRANS	83-3340-0381	1
000005	23007A036-1	B MINCOM	SHIELD-DOOR, HEAD COVER	83-3650-0367	1
000006	GP24-125X312	GROOV-PIN	PIN-GRVC,HDLs,.125DIA X.312 LG	83-7280-0466	1
000007	#0	GRCOV-PIN	PIN-GRVC,FDED,.067 DIAx.125LG	83-7280-0477	2

LAST OF 2 PAGES

M64 PAR 2-71

134

M E G P A R T S L I S T

TITLE		ROLLER ASSY-IDLER, 1/2 IN INCOM		CATALOG NO.	83-4240-0310	PL	23007A040-1	REV	D
REF.DES./FIND #	---FFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER		QTY.	
	REG. FND.	- MEGR PART NO.							
000001		SFF DESC		BRG-BALL, S814FCZ77LG31ZD-1-1		83-1230-0325		2	
000002		23007A041-1	B MINCOM	ROLLER-IDLER, 1/2 INCH, INCOMING		83-3240-0312		1	
000003		23007A042-1	C MINCOM	SHAFT-IDLER, ROLLER MTG		83-3280-0388		1	
000004		C2133-020-4		RING-RETNG, EXT, .224 ID		83-7270-0506		1	

LAST OF 2 PAGES

M64 PAR 2-71

M E G P A R T S L I S T

TITLE POLLER ASSY-IDLER,1/2 IN OUTGNG

CATALOG NO. 83-4240-0311

PL 23007A04C-2

REV D

REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	REG. ENC.	- MEGR PART NO.				

000001		SEE DFSC		BRG-BALL,S814FCZZ7LG31ZC-1-1	83-1230-0325	2
000002		23007A041-2	B MINCOM	ROLLER-IDLER,1/2 INCH,OUTGOING	83-3240-0313	1
000003		23007A042-1	C MINCOM	SHAFT-IDLER,ROLLER MTG	83-3280-0388	1
000004		C2133-020-4		RING-RETNG, FXT, .224 ID	83-7270-0506	1

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CAPSTAN ASSY-TAPE TRANS, 1/2 IN

CATALOG NO. 83-5920-0819

PL 23007A060-1

REV G

REF.DES./FIND # ---FFF--- DRAWING NUMBER MFG NAME DESCRIPTION PH CATALOG NUMBER QTY.
 PFG. FND. - MFG PART NO.

000001	10353CG-2	BARDEN	BRG-BALL, PLAIN, ANLR, .6693 BORE	83-1230-0313	1
000002	103HDB5CG-2	BARDEN	BRG-BALL, PLAIN, .6693 BORE	83-1230-0335	1
000004	23007A063-1	E MINCOM	TAPE CR-CAPSTAN, 1/2 IN TAPE	83-3240-0292	1
000005	19007AC22	D MINCOM	CAP-FLYWHEEL, PRECISION PLATE	83-3250-0082	1
000007	23007AC64-1	F MINCOM	SHAFT-CAPSTAN, TAPE DRIVE, 1/2 IN	83-3280-0409	1
000008	23007AC62	D MINCOM	HOUSING-CAPSTAN, TAPE DRIVE	83-3310-0836	1
000009	MS16625-137	MIL STD	RING-RETNG, INT, 1.486 OD	83-7270-0382	1
000011	00000A816	B MINCOM	RING-RETNG, INT, 1.526 FREE OP	83-3270-0768	1
000012			SCR-CAP, FH, 1/4X20X5/8, NYLOC	83-9262-0569	1
000013	23007ACC9-1	B MINCOM	SHIM-CAPSTAN, .002 THK	83-3230-0340	AR
000014	23007ACC9-2	B MINCOM	SHIM-CAPSTAN, .005 THK	83-3230-0368	AR
000015	23007ACC9-3	B MINCOM	SHIM-CAPSTAN, .010 THK	83-3230-0369	AR

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE		CATALOG NO.		PL		REV	
ARM ASSY-IDLER,ROLLER,LH		83-421C-0230		23013A090-1		B	
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER	QTY.
	BFG. END.	- MEGR PART NO.					
000001	398	23013AC57	3M	CASTING-ARM,ROLLER,IDLER		83-3140-0157	1
000002		23013A012	MINCOM	PIN-ACTUATOR,IDLER ARM		83-3280-0408	1
000003		GP67-125X500-12	GRONV-PIN	PIN-GRVC,HDL5, .125 DIA X .500 LG		83-7280-0202	1
000004		CLS-440-3	PENN ENGNRNG	NUT-CLINCH,PLAIN,4-40 X .250 WD		83-9264-0005	1

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE ARM ASSY-IDLER,RCLLER,PH

CATALOG NO. 83-4210-0231

PL 23013A090-2

REV B

REF.DES./FIND #	---FFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
REG. ENC.		- MEGR PART NO.				
000001	398	23013AC57	3M	CASTING-ARM,RCLLER,IDLER	83-3140-0157	1
000002		23013A012	MINCOM	PIN-ACTUATOR,IDLER ARM	83-3280-0408	1
000003		GP67-125X500-12	GRCCV-PIN	PIN-GRVC,FOLS, .125 DIA X .500LG	83-7280-0202	1
000004		CLS-440-3	PFNN ENGRNG	NUT-CLINCH,PLAIN,4-40 X .250WD	83-9264-0005	1

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE ARM ASSY-ACTUATOR, DOOR HD CVR

CATALOG NO. 83-4210-0237

PL 23013A095

REV B

REF.DES./FIND #	---FFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
BEG. FND.		- MFGR PART NO.				

000001		23007A031	C MINCOM	LEVER-DCCR, HEAD COVER	83-3210-0202	1
000002		23007A035	C MINCOM	BRACKET-LEVER MTG, DASHPOT	83-3320-1049	1

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CONTROL ASSY-REMOTE,OPTIONAL		CATALOG NO.	83-592C-0823	PL	23017A000	REV	C
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	DESCRIPTION		PH CATALOG NUMBER	QTY.
	BEG. END.	- MFGR PART NO.					
DS1,DS2,DS3,DS4, DS5 DS6		327	GENERAL	FLFC LAMP-INCANDESCENT, .04 AMP		83-1550-2506	5
		1-380672-4	AMP INC	LIGHT ASSY-PILOT,AMBER,24VOLTS		83-1550-2590	1
PI		201359-3	AMP INC	SHELL-COAN,RECT,26 POSITIONS		83-1610-0674	1
S1,S2,S3,S4,S5 S6,S7		1018P	PENDAR	SWITCH-PUSHBUTTON,SPDT,MOMENTY		93-1550-5177	5
		513-0101-604	DIALCO	SWITCH-MOMENTARY,MAKE		83-1550-5233	2
000001		23017AC01	MINCOM	PANEL-SWITCH, MODE CONTROL		83-3360-0975	1
000002		23017AC02	MINCOM	HOUSING-MODE CONTROL		83-3310-1039	1
000003		23017AC03	C MINCOM	CHASSIS-SWITCH, MODE CONTROL		83-3310-1040	1
000004		42980-1-LP	4 AMP INC	PIN-CONTACT,COAN,20-24 GA WIRE		83-1610-0698	15
000005		42452-1	AMP INC	CONT-ELECT, SOCKET CLIP,.220 WD		83-1610-0847	2
000006		201923-1	AMP INC	CLIP-SPRING TENSION, MALE		83-1620-0126	1
000007		201229-1	AMP INC	CLAMP-ELFC, STRAIN REL,.779 MCE		83-1650-0244	1
000008		00000A769	C MINCOM	LABEL-IDENTIFICATION,MODULE		83-3550-1621	1
000009		200389-4	AMP INC	PIN-GUIDE,CENTER,AMP SERIES M		83-7280-0196	1
000010		TY15	THOMS & BETS	CLAMP-LCOP,NYLON TYRAP,7.81 LG		83-7650-0056	1
000011		8748	BFLDEN	WIRE-TYPE 8748, 22 GA,18CONDU		83-7910-0534	AR
000012		200390-4	AMP INC	REC-GUIDE PIN,CENTER,SERIES M		83-7270-0302	1
000013		#7	RUPBERCRAFT	GROMMET-RUBBER,.375ID X.687 OD		83-9630-0097	1
000014		MS35206-229	MIL STD	SCREW-MACH,PAN HD,6-32 X 7/16		83-9260-4532	5
000015		MS24693-S25	MIL STD	SCREW-MACH,FH,6-32 X 5/16		83-9260-6555	2
000016		MS35338-41	MIL STD	WASHER-LOCK,SPLIT, #6		83-9261-4305	5
000017				WASHER-FLAT,SM PATT,#6		83-9261-4013	5
000018	520	16049B015-1	A MINCOM	LENS-INC LIGHT, *REWIND*		83-3550-1982	1
000019	520	16049B015-2	A MINCOM	LENS-INC LIGHT, *FORWARD*		83-3550-1983	1
000020	520	16049B015-3	A MINCOM	LENS-INC LIGHT, *RECORD*		83-3550-1984	1
000021	520	16049B015-4	A MINCOM	LENS-INC LIGHT, *PLAY*		83-3550-1985	1
000022	520	23013BC38	A MINCOM	LENS-INC LIGHT, *STOP*		83-3550-1981	1
000023		185-1873	DIALCO	LENS-CAP ASSY,1/2 IN SQ,AMBER		83-1550-5243	1

M64 PAR 2-71

M E G P A R T S L I S T

TITLE CONTROL ASSY-REMOTE,OPTIONAL		CATALOG NO. 83-5920-0823	PL 23017A000	REV C
REF.DFS./FIND # ---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER QTY.
BEG. END.	- MEGR PART NO.			
000074	185-1872	DIALCO	LENS-CAP ASSY,1/2 IN SQ,GREEN	83-1550-5244 1
LAST OF 3 PAGES				

M64 PAR 2-71

MFG PARTS LIST

TITLE CABLE ASSY-PWR, 4TRK, 36 IN		CATALOG NO.	83-4570-0346	PL	23028A050	REV	B
REF. DES. / FIND #	---FFF---	DRAWING NUMBER	MFGP NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.	
BEG. END.		- MFGP PART NO.					
000001		6061P-4	AMP INC	CONTACT-ELEC, PIN, .084 DIA	83-1610-0925	51	
000002		1-480278-0	AMP INC	SHELL-CAN, RECT, 12 POSITIONS	83-1610-0931	1	
000003		1-480324-0	AMP INC	SHELL-CAN, RECT, 15 POSITION	83-1610-0933	4	
000004			NATL WIRE	WIRE-PVC, TYPE B, 22GA YELLOW	83-7910-0040	AR	
000005			NATL WIRE	WIRE-TYPE B, 22GA VIO NYLON JKT	83-7910-0041	AR	
000006			NATL WIRE	WIRE-PVC, TYPE B, 22GA GRAY	83-7910-0042	AR	
000007			NATL WIRE	WIRE-TYPE B, 22GA BLU NYLON JKT	83-7910-0044	AR	
000008			NATL WIRE	WIRE-TYPE B, 22GA BLK NYLON JKT	83-7910-0045	AR	
000009			NATL WIRE	WIRE-TYPE B, 22GA, GRN NYLN JKT	83-7910-0248	AR	
000010			NATL WIRE	WIRE-TYPE B, 22GA RED NYLON JKT	83-7910-0249	AR	
000011			NATL WIRE	WIRE-TYPE B, 22GA, BRN NYLN JKT	83-7910-0251	AR	
000012		3025-070-5/16 ID 3M		TUBING-SCOTCHTITE, CLEAR VINYL	83-7910-0279	AR	
000013		NB1934N2SJ	NATL WIRE	WIRE-TYPE B, 22GA RED/BLU 2 CON	83-7910-0362	AR	
000014		GSC134C	THOM & BETTS	FERRULE-RF CABLE GND .134IC	83-9690-0020	8	
000015		GSC194C	THOMAS & BETTS	FERRULE-RF CABLE GROUNDING	83-9690-0118	8	
000016			NATL WIRE	WIRE-TYPE B, 22 GA ORNG NYL JKT	83-7910-0250	AR	

LAST OF 2 PAGES

M F G P A R T S L I S T

TITLE PC RD ASSY-BIAS ERASE

CATALOG NO. 83-4930-2952

PL 23059B020

REV C

RFF.DES./FIND # ---EFF---
BEG. END.DRAWING NUMBER
- MFG PART NO.

MFG NAME

D E S C R I P T I O N

PH CATALOG NUMBER QTY.

C1	112A1A104M	HOPKINS	CAP-FXD,PAPER, .10UF, 50V,20%	83-1510-4185	1
C2	107X002	SPRAGUE	CAP-FXD,TA, 100 UF, 25V, 20%	83-1510-6222	1
C3,C20	TSD5-35-156	COMP INC	CAP-FXD, TA, 15UF 35V 20%	83-1510-6209	2
C4,C5	210B1B103J	ELECTRO CUBE	CAP-FXD,PLSTC, .01UF,100V, 5%	83-1510-4192	2
C6,C7,C8,C9	TSD-1-20-225	CCMP INC	CAP-FXD,TA, 2.2UF 20V 20%	83-1510-6240	4
C10,C13,C16	192P10392	SPRAGUE	CAP-FXD,PAPER, .01 UF,200V,10%	83-1510-4414	3
C12,C15	TSD3-15-226	CCMP INC	CAP-FXD,TA, 22UF 15V 20%	83-1510-6257	2
C14,C17	192P33292	SPRAGUE	CAP-FXD,PAPER,.0033UF,200V,10%	83-1510-4405	2
C18	WMF1547	CORNEL-DUBLR	CAP-FXD,PLSTC,.047UF 100V 10%	83-1510-4481	1
C19	SEE DESC	ERIE	CAP-FXD,270PF,831-000-X5F-271K	83-1510-1103	1
C21	4610	ARCO	CAP-VAR,MICA,190-900 PF	83-1510-6252	1
CR1,CP2,CR3	1N270	HUGHES	DIODE-GE,GEN PUR,1COPIV, 60 MA	83-1530-0263	3
L1	4631	J.W. MILLER	INDUCTOR-FXD,82UH,250MA	83-1540-0409	1
L2	70F333AI	J.W. MILLER	CHOKERF,3.3 MH 5 %	83-1540-0410	1
Q1,Q2,Q5,Q6	2N3053	R.C.A.	TSTR-SI,NPN, PWR, 60 VCB	83-1530-2180	4
Q3,Q4	2N3054	R.C.A.	TSTR-SI,NPN, H PWR, 100 PFE	83-1530-2227	2
R1,R14,R17	0A781-7221	MINCOM SPEC	RES-FXD,FILM,100 OHM,1/2W,2% S	83-1520-7221	3
R2	0A781-7358	MINCOM SPEC	RES-FXD,FILM,820 OHM,1/2W,2% S	83-1520-7358	1
R3	3282W-1-102	BOURNS INC	RES-VAR,COMP, 1 K OHM 1W 10%	83-1520-1401	1
R4	0A781-7175	MINCOM SPEC	RES-FXD,FILM,1K OHM,1/2W,2% S	83-1520-7175	1
R5,R27	0A781-7144	MINCOM SPEC	RES-FXD,FILM,15K OHM,1/2W,2% S	83-1520-7144	2
R6,R8	0A781-7360	MINCOM SPEC	RES-FXD,FILM,2.2K OHM,1/2W,2% S	83-1520-7360	2
R7,R28	0A781-7145	MINCOM SPEC	RES-FXD,FILM,12K OHM,1/2W,2% S	83-1520-7145	2
R9,R10	0A781-7355	MINCOM SPEC	RES-FXD,FILM,560 OHM,1/2W,2% S	83-1520-7355	2
R11,R12	0A781-7337	MINCOM SPEC	RES-FXD,FILM,47 OHM,1/2W,2% S	83-1520-7337	2
R13	0A781-7363	MINCOM SPEC	RES-FXD,FILM,3.9K OHM,1/2W,2% S	83-1520-7363	1
R15,R18	0A781-7329	MINCOM SPEC	RES-FXD,FILM,22 OHM,1/2W,2% S	83-1520-7329	2
R16	0A781-7146	MINCOM SPEC	RES-FXD,FILM,18K OHM,1/2W,2% S	83-1520-7146	1
R19,R22	0A781-7331	MINCOM SPEC	RES-FXD,FILM,27 OHM,1/2W,2% S	83-1520-7331	2

M64 PAR 2-71

M F G P A R T S L I S T

TITLE PC BD ASSY-BIAS ERASE		CATALOG NO. 83-4930-2952		PL 23059B02C		REV C	
REF.DES./FIND #	---EFF--- BEG. ENC.	DRAWING NUMBER - MFGR PART NO.	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.	
R20,R21		0A781-7147	MINCOM SPEC	RES-FXD,FILM,4.7K OHM,1/2W,2%	83-1520-7147	2	
R23		3067P-1-502	BOURNS	RES-VAR, WW, 5K OHM 1/2W 10%	83-1520-1319	1	
R24		77PR10K	BECKMAN	RES-VAR,COMP,10K OHM,3/4 W,10%	83-1520-1213	1	
R25		77PR1K	BECKMAN	RES-VAR,COMP,1K OHM,3/4 W, 10%	83-1520-1211	1	
R26		0A781-7379	MINCOM SPEC	RES-FXD,FILM,47K OHM,1/2W,2% S	83-1520-7379	1	
R29		0A781-7325	MINCOM SPEC	RES-FXD,FILM,10 OHM,1/2W,2% S	83-1520-7325	1	
T1		00000A718	A MINCOM	XFMR-TORROIDAL,ARNOLD CORE	83-3540-1150	1	
T2,T4,T5		0000CA719	A MINCOM	XFMR-TORROIDAL,ARNOLD CORE	83-3540-1151	3	
T3		00000A720	A MINCOM	XFMR-TORROIDAL,ARNOLD CORE	83-3540-1152	1	
TP1		3-582118-9	APP INC	JACK-TIP,.156 WD X .460 DP	83-1610-0752	1	
000001		23059B021	B MINCOM	PC BD-BIAS ERASE	83-3640-1877	1	
000002		00000A667	B MINCOM	HANDLE-EJECTOR,P.C. BD,1.50 LG	83-3270-0371	1	
000003		79-C22-094-0250	ESNA	PIN-SPRING, .094 DIA X .250 LG	83-7280-0270	1	
000004		00000A734-1	B MINCOM	LABEL-ICENT,P.C. BD,MARKED *1*	83-3550-1446	1	
000005		23059A016	A MINCOM	BRACKET-COMPONENT MTG,SIG ELEC	83-3320-1132	1	
000006		#EXE-22-122	THERMAX	WIRE-TYPE C,22GA WHT TEFLN JKT	83-7910-0476	AR	

LAST OF 3 PAGES

MFG PARTS LIST

TITLE PC BD ASSY-CONVERSION,NAB,REC		CATALOG NO.	83-4930-2961	PL	230598030	REV	A
REF.DES./FIND #	---EFF--- BEG. END.	DRAWING NUMBER - MFG PART NO.	MFG NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.	
C1		TYPE 311	ARCO	CAP-VAR,MICA,780-2110PF 250V	83-1510-6274	1	
C2		0A936-5028	MINCOM SPEC	CAP-FXD,MICA, 470 PF 500V 5%	83-1510-5028	1	
L1		WEE-1000	NYTRONICS	INDUCT-FXD,RF,1000 OH 140 MA	83-1540-0547	1	
R3		3067P-1-502	BOURNS	RES-VAR, WW, 5K OHM 1/2W 10%	83-1520-1319	1	
TP1		3-5E2118-9	AMP INC	JACK-TIF,.156 WD X .460 DP	83-1610-0752	1	
000001		230598031	B MINCOM	PC BD-CONVERSION,NAB,RECORD	83-3640-1886	1	
000002		30113A018-2	A MINCOM	SHIELD-CIRCUIT BD	83-3650-0387	1	
000003		00000A667	B MINCOM	HANDLE-EJECTOR,P.C. BD,1.50 LG	83-3270-0371	1	
000004		79-022-094-0250	ESNA	PIN-SPRING, .094 DIA X .250 LG	83-7280-0270	1	
000005		1434	BIRNBACH	WIRE-BUS,22GA ROUND	83-7910-0105	AR	
000006		MS35206-202	MIL STD	SCREW-PACH,PAN HD,2-56 X 3/16	83-9260-4501	4	
000007				WASHER-FLAT,GENERAL PURPOSE,#2	83-9261-4040	4	
000008		MS35238-39	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#2	83-9261-4301	4	
000009		00000A734-2	B MINCOM	LABEL-IDENT,P.C. BD,*3N*	83-3550-1447	1	
000010		NAS620-416	NAS STD	WASHER-FLAT,SM PATT,#1/4	83-9261-4043	2	

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE P.C. BD ASSY-RECORD,NAR

CATALOG NO. 83-4930-1214

PL 230598040

REV G

RFF.DFS./FIND # ---EFF--- DRAWING NUMBER MFGR NAME DESCRIPTION PH CATALOG NUMBER QTY.
BFG. END. - MFGR PART NO.

C1,C10,C14	TSD3-15-226	COMP INC	CAP-FXD,TA, 22UF 15V 20%	83-1510-6257	3
C2	W210B1V334J	ELECTRC CUBE	CAP-FXD,MYLAR,.33UF,150V, 5%	83-1510-4301	1
C3	112A1B683K	ELECTRO CUBE	CAP-FXD,PAPER,.068 UF,100V,10%	83-1510-4332	1
C4	112A1A104J	ELECTRO-CUBE	CAP-FXD,PAPER, .10UF 50V 5%	83-1510-4310	1
C5	17W8203J	JEDCO	CAP-FXD,PLSTC, .02UF,100V, 5%	83-1510-4191	1
C7	TSD-1-20-225	COMP INC	CAP-FXD,TA, 2.2UF 20V 20%	83-1510-6240	1
C8	F3FR-332-1C	MIDWEC	CAP-FXD,PLSTC,.0033UF 100V 5%	83-1510-4445	1
C9	TSD5-20-686	COMP INC	CAP-FXD,TA, 68UF 20V 20%	83-1510-6211	1
C11	TSD5-20-476	COMP INC	CAP-FXD,TA, 47UF 20V 20%	83-1510-6199	1
C12	TSD5-6-227	COMP INC	CAP-FXD,TA, 220UF 6V 20%	83-1510-6259	1
C13	TSD5-35-156	COMP INC	CAP-FXD,TA, 15UF 35V 20%	83-1510-6209	1
C15	TSD1-20-475	COMP INC	CAP-FXD,TA, 4.7UF 20V 20%	83-1510-6196	1
C17	210B1C102K	ELECTRO CUBE	CAP-FXD,PLSTC,.001 UF,200V,10%	83-1510-4296	1
C18,C19	464	ARCO	CAP-VAR,MICA,25 MMF-280 MMF	83-1510-6277	2
K1	701-3	ELEC-TROL	RELAY-SPDT, 2K OHM 24VDC	83-1550-3620	1
Q1,Q3,Q7	2N3391A	GENERAL ELEC	TSTR-SI,NPN, PWR, 25 VCR	83-1530-2230	3
Q2	2N3684		TSTR-SI,N-CHAN,FLD EFFECT 50MA	83-1530-2244	1
Q4	2N3405	G.E.	TSTR-SI,NPN,GEN PUR,50VCE	83-1530-2232	1
Q5,Q6	2N2614	RCA	TSTR-GE,PNP, SIGNAL, 40VCR	83-1530-2233	2
R1	0A781-7397	MINCOM SPEC	RES-FXD,FILM,390K OHM,1/2W,2% S	83-1520-7397	1
R2,R25	0A781-7372	MINCOM SPEC	RES-FXD,FILM,22K OHM,1/2W,2% S	83-1520-7372	2
R3	0A781-7148	MINCOM SPEC	RES-FXD,FILM,10K OHM,1/2W,2% S	83-1520-7148	1
R4	0A781-7175	MINCOM SPEC	RES-FXD,FILM,1K OHM,1/2W,2% S	83-1520-7175	1
R5	0A781-7174	MINCOM SPEC	RES-FXD,FILM,390 OHM,1/2W,2% S	83-1520-7174	1
R6,R24	0A781-7393	MINCOM	RES-FXD,FILM,270K OHM,1/2W,2% S	83-1520-7393	2
R7	0A781-7372	MINCOM SPEC	RES-FXD,FILM,27K OHM,1/2W,2% S	83-1520-7373	1
R8	0A781-7387	MINCOM SPEC	RES-FXD,FILM,100K OHM,1/2W,2% S	83-1520-7387	1
R9,R14	0A781-7369	MINCOM SPEC	RES-FXD,FILM,8.2K OHM,1/2W,2% S	83-1520-7369	2
R10	0A781-7360	MINCOM SPEC	RES-FXD,FILM,2.2K OHM,1/2W,2% S	83-1520-7360	1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE P.C. BD ASSY-RECCRD,NAB		CATALOG NO.	83-4930-1214		PL	23059B040	REV	G
RFF.DES./FIND #	---EFF--- RFG. END.	DRAWING NUMBER - MFGR PART NO.	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.		
12		0A781-7148	MINCOM SPEC	RES-FXD,FILM,10K OHM,1/2W,2% S	83-1520-7148	1		
13		0A781-7383	MINCOM SPEC	RES-FXD,FILM,68K OHM,1/2W,2% S	83-1520-7383	1		
15		0A781-7201	MINCOM SPEC	RES-FXD,FILM,1.8K OHM,1/2W,2% S	83-1520-7201	1		
16,R29		0A781-7147	MINCOM SPEC	RES-FXD,FILM,4.7K OHM,1/2W,2% S	83-1520-7147	2		
17		0A781-7359	MINCOM SPEC	RES-FXD,FILM,1.2K OHM,1/2W,2% S	83-1520-7359	1		
18		0A781-7342	MINCOM SPEC	RES-FXD,FILM,82 OHM,1/2W,2% S	83-1520-7342	1		
19	426	0A781-7327	MINCOM SPEC	RES-FXD,FILM,18 OHM,1/2W,2% S	83-1520-7327	1		
20		77PR100	BECKMAN	RES-VAR,COMP,100 OHM,3/4 W,10%	83-1520-1153	1		
21		0A781-7333	MINCOM SPEC	RES-FXD,FILM,33 OHM,1/2W,2% S	83-1520-7333	1		
22		0A781-7345	MINCOM SPEC	RES-FXD,FILM,180 OHM,1/2W,2% S	83-1520-7345	1		
23		0A781-7379	MINCOM SPEC	RES-FXD,FILM,47K OHM,1/2W,2% S	83-1520-7379	1		
26		0A781-7367	MINCOM SPEC	RES-FXD,FILM,6.8K OHM,1/2W,2% S	83-1520-7367	1		
27		0A781-7220	MINCOM SPEC	RES-FXD,FILM,220 OHM,1/2W,2% S	83-1520-7220	1		
28		0A781-7350	MINCOM SPEC	RES-FXD,FILM,330 OHM,1/2W,2% S	83-1520-7350	1		
30		77PR10K	BECKMAN	RES-VAR,COMP,10K OHM,3/4 W,10%	83-1520-1213	1		
1		TYPE G350-PC	CENTL WIRT	SWITCH-SLIDE, DPDT,125V 3AMP	83-1550-5212	1		
TP1		3-582118-9	AMP INC	JACK-TIF,.156 WD X .460 DP	83-1610-0752	1		
TP2		3-582118-0	AMP INC	JACK-TEST,.156WD X .230 HT,BLK	83-1610-0765	1		
000001		0000CA667	B MINCOM	HANDLE-EJECTOR,P.C. BD,1.50 LG	83-3270-0371	1		
000002		23059A016	A MINCOM	BRACKET-COMPONENT MTG,SIG ELEC	83-3320-1132	2		
000003		00000A734-3	B MINCOM	LABEL-ICENT,P.C.BD, #4*	83-3550-1448	1		
000004		23059B041	F MINCOM	P.C. BD-RECORD,NAB	83-3640-0729	1		
000005		79-022-094-0250	ESNA	PIN-SPRING, .094 DIA X .250 LG	83-7280-0270	1		
000006		7717-2	THERMALLOY	PAD-TSTR, INLINE, 3 LEADS	83-9690-0191	3		
000007		MS35206-215	MIL STD	SCREW-MACH,PAN HD,4-40 X 3/8	83-9260-4515	1		
000008		MS35649-42	MIL STD	NUT-HEX,PLAIN,4-40 X .250 WD	83-9260-2003	1		
000009		MS27183-4	MIL STD	WASHER-FLAT,GENERAL PURPOSE #4	83-9261-4002	1		
000010		MS35338-40	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#4	83-9261-4303	1		
000012		1434	BIRNBACH	WIRE-BUS,22GA ROUND	83-7910-0105	AR		

LAST OF 3 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE	P.C. BD ASSY-LNE	AMP, SIG ELEC	CATALOG NO.	83-493C-1091	PL	23059A060	REV	J
REF. DES. / FIND #	---FFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.		
	PFG. FND.	- MEGR PART NO.						
C1		TSD5-35-156	COMP INC	CAP-FXC, TA, 15UF 35V 20%	83-1510-6209	1		
C2, C6		TSD4-20-226	COMP INC	CAP-FXD, TA, 22UF 20V 20%	83-1510-6203	2		
C3		625B1R103J	ELECTRO CUBF	CAP-FXC, MYLAR, .01 UF, 100 V	83-1510-4227	1		
C4, C5		977-123	GEN INSTR	CAP-FXC, ELECT, 150UF 50V	83-1510-2212	2		
C7		TSD5-20-476	COMP INC	CAP-FXD, TA, 47UF 20V 20%	83-1510-6199	1		
C8		0A836-5148	MINCOM SPEC	CAP-FXC, MICA, 50PF 500V 5%	83-1510-5148	1		
C9		TSD1-35-105	COMP INC	CAP-FXD, TA, 1UF 35V 20%	83-1510-6208	1		
C10		TSD5-10-157	COMP INC	CAP-FXD, TA, 150UF 10V 20%	83-1510-6245	1		
C11, C12		DD102	AEROVOX	CAP-FXC, CER, 1000PF 1000V GMV	83-1510-1024	2		
C13		0A836-5214	MINCOM SPEC	CAP-FXC, MICA, 200PF 500V 5%	83-1510-5214	1		
C14		977-163	GEN INSTR	CAP-FXD, ELECT, 500UF 25V	83-1510-2044	1		
C15		210D1C224K	MINCOM	CAP-FXC, MY, .22 UF, 200 VDC, 10%	83-1510-4569	1		
CR1, CR2, CR3, CR4, CR5, CR6, CR7		IN4004	MOTOROLA	RECT -SI, DIF JCT, 400PIV 1 AMP	83-1530-0151	7		
Q1, Q2, Q3		2N3391A	GENERAL ELEC	TSTR-SI, NPN, PWR, 25 VCB	83-1530-2230	3		
Q4		2N3638	FAIRCHILD	TSTR-SI, PNP, SW, 25 VCB	83-1530-2155	1		
Q5, Q6		2N3054	R.C.A.	TSTR-SI, NPN, H PWR, 100 HFE	83-1530-2227	2		
R1	1545	0A781-7219	MINCOM SPEC	RES-FXD, FILM, 3K OHM, 1/2W, 2% S	83-1520-7219	1		
R2, R17, R21		0A781-7175	MINCOM SPEC	RES-FXC, FILM, 1K OHM, 1/2W, 2% S	83-1520-7175	3		
R3		0A781-7368	MINCOM SPEC	RES-FXD, FILM, 7.5K OHM, 1/2W, 2% S	83-1520-7368	1		
R4	1545	3067P-1-502	BOURNS	RES-VAR, WW, 5K OHM 1/2W 10%	83-1520-1319	1		
R5, R8, R15, R22		0A781-7148	MINCOM SPEC	RES-FXC, FILM, 10K OHM, 1/2W, 2% S	83-1520-7148	4		
R6		, LITTLE DEVIL	OHMITE	RES-FXD, COMP, 820K OHM 1/2W 5	83-9520-3218	1		
R7		0A781-7398	MINCOM SPEC	RES-FXC, FILM, 430K OHM, 1/2W, 2% S	83-1520-7398	1		
R9		0A781-7359	MINCOM SPEC	RES-FXD, FILM, 1.2K OHM, 1/2W, 2% S	83-1520-7359	1		
R10, R12		0A781-7221	MINCOM SPEC	RES-FXC, FILM, 100 OHM, 1/2W, 2% S	83-1520-7221	2		
R11		0A781-7346	MINCOM SPEC	RES-FXC, FILM, 200 OHM, 1/2W, 2% S	83-1520-7346	1		
R13		3067P-1-502	BOURNS	RES-VAR, WW, 5K OHM 1/2W 10%	83-1520-1319	1		
R14		0A781-7263	MINCOM SPEC	RES-FXC, FILM, 2K OHM, 1/2W, 2% S	83-1520-7263	1		
R16		0A781-7219	MINCOM SPEC	RES-FXC, FILM, 3K OHM, 1/2W, 2% S	83-1520-7219	1		

M64 PAR 2-71

M E G P A R T S L I S T

TITLE	P.C. BD ASSY-LNE	AMP,SIG ELEFT	CATALOG NO.	83-4930-1091	PL	23059A060	REV	J
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER	QTY.	
	REF. END.	- MEGR PART NO.						
R18		0A781-7344	MINCOM SPEC	RES-FXD,FILM,120 OHM,1/2W,2% S		83-1520-7344	1	
R19,R20		0A781-7357	MINCOM SPEC	RES-FXD,FILM,750 OHM,1/2W,2% S		83-1520-7357	2	
R23		0A781-7329	MINCOM SPEC	RES-FXC,FILM,22 OHM,1/2W,2% S		83-1520-7329	1	
R24		LITTLE DEVIL	OHMITE	RES-FXD,COMP,2.7 OHM 1/2W 5%		83-9520-3258	1	
P25		0A781-7360	MINCOM SPEC	RES-FXD,FILM,2.2K OHM,1/2W,2% S		83-1520-7360	1	
S1,S2		TYPE G350-PC	CCNTL WIRT	SWITCH-SLIDE, DPDT,125V 3AMP		83-1550-5212	2	
TP1		3-582118-9	AMP INC	JACK-TIP,.156 WD X .460 DP		83-1610-0752	1	
000001		23059A061	H MINCOM	PC860-LINE AMPLIFIER		83-3640-0668	1	
000002		00000A667	B MINCOM	HANDLE-EJECTOR,P.C. BD,1.50 LG		83-3270-0371	1	
000003		79-022-094-0250	FSNA	PIN-SPRING, .094 DIA X .250 LG		83-7280-0270	1	
000004		00000A734-4	B MINCOM	LABEL-ICENT,P.C. BD,*6*		83-3550-1449	1	
000006		MS35206-215	MIL STD	SCREW-MACH,PAN HD,4-40 X 3/8		83-9260-4515	4	
000007				NUT-HEX,SM PATT,4-40 X .188 WD		83-9260-2201	4	
000008				WASHER-FLAT,.219 CD X .125 ID		83-9261-4012	4	
000009		MS35338-40	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#4		83-9261-4303	4	
000010		7717-2	THERMALLOY	PAD-TSTR, INLINE, 3 LEADS		83-9690-0191	3	

LAST OF 3 PAGES

M64 PAR 2-71

M E G P A R T S L I S T

TITLE PC RD ASSY-PREFAMP, OVPUR 7.5-15		CATALOG NO.	83-4930-2180	PL	230598090-1	REV	H
REF. DES. / FIND #	-----	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER	QTY.
REQ. END.		- MEGR PART NO.					
C1, C6		TS04-20-226	COMP INC	CAP-FXD, TA,	22UF 20V 20%	83-1510-6203	2
C2		0A836-5096	MINCOM SPEC	CAP-FXD, MICA,	270PF 500V 5%	83-1510-5096	1
C3		TS05-20-686	COMP INC	CAP-FXD, TA,	68UF 20V 20%	83-1510-6211	1
C4		TS05-6-227	COMP INC	CAP-FXD, TA,	220UF 6V 20%	83-1510-6259	1
C5		E35P-103-10	MIDWEC	CAP-FXD, PLSTC,	.010UF 100V 5%	83-1510-4449	1
C7, C8		E35P-682-10	MIDWEC	CAP-FXD, PLS	.0068UF 100V 5%	83-1510-4447	2
C9, C10		TS05-35-156	COMP INC	CAP-FXD, TA,	15UF 35V 20%	83-1510-6209	2
C11		0A836-5120	MINCOM SPEC	CAP-FXD, MICA,	500PF 500V 5%	83-1510-5120	1
K1		701-3	ELEC-TROL	RELAY-SPST, 2K OHM	24VDC	83-1550-3620	1
K2		201-3	ELECTROL	RELAY-SPST, 2K OHM	24 V DC	83-1550-3621	1
L1		70F333AT	J.W. MILLER	CHOKEREF, 3.3 MH	5 %	83-1540-0410	1
01, 02		2N4384	SPRAGUE	TSTR-SI, NPN,	SW, 40 VCR	83-1530-2156	2
03, 04, 05		2N3391A	GENERAL ELEC	TSTR-SI, NPN,	PWP, 25 VCR	83-1530-2230	3
R1, P5		LITTLE DEVIL	OHMITE	RES-FXD, COMP,	1M OHM 1/2W 5%	83-9520-3220	2
R2		0A781-7344	MINCOM SPEC	RES-FXD, FILM,	120 OHM, 1/2W, 2%	83-1520-7344	1
R3		0A781-7393	MINCOM	RES-FXD, FILM,	270K OHM, 1/2W, 2%	83-1520-7393	1
R4		0A781-7350	MINCOM SPEC	RES-FXD, FILM,	330 OHM, 1/2W, 2%	83-1520-7350	1
P6, P25		0A781-7373	MINCOM SPEC	RES-FXD, FILM,	27K OHM, 1/2W, 2%	83-1520-7373	2
P7, R18, P21		0A781-7389	MINCOM SPEC	RES-FXD, FILM,	180K OHM, 1/2W, 2%	83-1520-7389	3
P8		0A781-7174	MINCOM SPEC	RES-FXD, FILM,	390 OHM, 1/2W, 2%	83-1520-7174	1
R9		0A781-7367	MINCOM SPEC	RES-FXD, FILM,	6.8K OHM, 1/2W, 2%	83-1520-7367	1
P10		0A781-7375	MINCOM SPEC	RES-FXD, FILM,	33K OHM, 1/2W, 2%	83-1520-7375	1
R11, P12, P13, P14,		0A781-7201	MINCOM SPEC	RES-FXD, FILM,	1.8K OHM, 1/2W, 2%	83-1520-7201	5
R15							
P16		0A781-7147	MINCOM SPEC	RES-FXD, FILM,	4.7K OHM, 1/2W, 2%	83-1520-7147	1
P17		0A818-1535	MINCOM SPEC	RES-VAR, CERMET,	5K OHM, 1/2W S	83-1520-1535	1
R19, P22	496	89DP1M	BECKMAN	RES-VAR, CFR,	1M OHM 3/4 W 20%	83-1520-1567	2
R20, P23	497	89DP20K	BECKMAN	RES-VAR, CFR,	20K OHM 3/4 W 20%	83-1520-1568	2

M64 PAR 2-71

M E C P A R T S L I S T

TITLE PC RD ASSY-PREAMP, OVERDR 7.5-15

CATALOG NO. 83-4930-2180

PI 230598090-1

REV H

REF. DES. / FIND #	---EE---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	REQ. END.	- MEGR PART NO.				
P24		0A781-7360	MINCOM SPEC	RES-FXD, FILM, 2.2K OHM, 1/2W, 2% S	83-1520-7360	1
P26		0A781-7218	MINCOM SPEC	RES-FXD, FILM, 680 OHM, 1/2W, 2% S	83-1520-7218	1
T1		TR-145 RV-35845	REYER XMER	XFMR-AUDIO FREQ, 15 K HZ, 80 OHM	83-1540-1284	1
000001		230598091	G MINCOM	PC2408-PREAMP, OVERDR	83-3640-1507	1
000002		00000A667	B MINCOM	HANDLE-EJECTOR, P.C. 80, 1.50 LG	83-3270-0371	1
000003		79-022-094-0250	FSNA	PIN-SPRING, .094 DIA X .250 LG	83-7280-0270	1
000004		7717-2	THERMALLOY	PAD-TSTR, INLINE, 3 LEADS	83-9690-0191	5
000005		00000A734-7	B MINCOM	LABEL-IDENT, P.C. 80, *7 9*	83-3550-1452	1
000008		A-10042-DAP	MILTON ROSS	PAD-TSTR, .250 DIA X .080 DP	83-9690-0104	2

LAST OF 3 PAGES

M64 PAR 2-71

M E G P A R T S L I S T

TITLE PC RD ASSY-PREFAMP, OVERDRIVE 15/30 CATALOG NO. 83-4930-2511 PL 230598090-2 REV H
 REF. DES. / FIND # ---FFF--- DRAWING NUMBER MEGR NAME DESCRIPTION PH CATALOG NUMBER QTY.
 BEG. END. - MEGR PART NO.

SAME AS 230598090-1 EXCEPT AS NOTED BELOW

R11, R12, R15	0A781-7201	MINCOM SPEC	RES-FXD, FILM, 1.8K OHM, 1/2W, 2% S	83-1520-7201	3
R13, R14	0A781-7264	MINCOM SPEC	RES-FXD, FILM, 910 OHM, 1/2W, 2% S	83-1520-7264	2

M F G P A R T S L I S T

TITLE P.C. BD ASSY-EXTENDER		CATALOG NO. 83-4930-1746		PL 23059A110		REV A	
REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.	
		BEG. END. - MFGR PART NO.					
000001		23059A111	B MINCOM	P.C. BD-EXTENDER	83-3640-1139	1	
000002		2VK22S/1-2	VIKING	CONN-P.C., ELFC, PIERCD, 22 CON	83-1610-0845	1	
000003		MS35206-217	MIL STD	SCREW-MACH, PAN HD, 4-40 X 1/2	83-9260-4517	2	
000004				WASHER-FLAT, .219 OD X .125 ID	83-9261-4012	2	
000005		MS35338-40	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #4	82-9261-4307	2	
000006		1434	BIRNBACH	WIRE-BUS, 22GA ROUND	83-7910-0105	AP	
000007		TFT-200/22	ALPHA WIRE	TUBING-TEFLON, #22, .027 ID, NAT	83-7910-0388	AR	

LAST OF 2 PAGES

M64 PAR 2-71

154

M64 PAR 2-71

M F G P A R T S L I S T

TITLE MOTOR ASSY-7 1/2-15, 60 HZ

CATALOG NO. 93-4560-0225

PL 56007A060-1

REV F

REF.DES./FIND # ---EFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
BEG. END. - MFGR PART NO.

C64		200P1450	SPRAGUE	CAP-FXD, PLSTC, 2.UF 440V 10%	83-1510-4433	1
P8		1-490324-0	AMP INC	SHELL-CAN, RECT, 15POSITION	83-1610-0933	1
000001		56007AC40-1	A MINCOM	MOTOR-CAPSTAN, 7 1/2-15 IPS, 60C	93-3560-0220	1
000002	354	56007B061	A MINCOM	BRACKET-CAPSTAN MOTOR MTG	83-3320-2426	1
000003		3-36-150E	SPRAGUE	BRACKET-CAPACITOR MTG, .750 WD	83-1320-1116	2
000004		MS16998-28	MIL STD	SCREW-CAP, SOC HD, 10-32 X 5/8	83-9261-2102	4
000005		60618-4	AMP INC	CONTACT-ELEC, PIN, .084 DIA	83-1610-0925	12
000006		56007AC42	A MINCOM	SHIELD-CAPSTAN MOTOR	83-3650-0600	1
000007		MS27193-8	MIL STD	WASHER-FLAT, GENERAL PURPOSE, #10	83-9261-4006	4
000008		MS35338-43	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #10	83-9261-4307	4
000009		MIL-W-16978	NATL WIRE	WIRE-TYPE B, 22GA WHT NYLON JKT	83-7910-0043	AR

LAST OF 2 PAGES

MFG PARTS LIST

TITLE MOTOR ASSY-7 1/2-15, 50 HZ

CATALOG NO. 83-4560-0227

PL 56007A060-2

REV F

REF.DES./FIND # ---EFF--- DRAWING NUMBER MFGR NAME DESCRIPTION PH CATALOG NUMBER QTY.
BEG. END. - MFGR PART NO.

C64		200P1450	SPRAGUE	CAP-FXD, PLSTC, 2.UF 440V 10%	83-1510-4433	1
P8		1-480324-0	AMP INC	SHELL-CCNN, RECT, 15POSITION	83-1610-0933	1
000001		56007A040-3	A MINCOM	MOTOR-CAPSTAN, 7 1/2-15 IPS, 50C	83-3560-0222	1
000002	354	56C078C61	A MINCOM	BRACKET-CAPSTAN MOTOR MTG	83-3320-2426	1
000003		3-36-150E	SPRAGUE	BRACKET-CAPACITOR MTG, .750 WD	83-1320-1116	2
000004		MS16998-28	MIL STD	SCREW-CAP, SOC TD, 10-32 X 5/8	83-9261-2102	4
000005		60618-4	AMP INC	CONTACT-ELEC, PIN, .084 DIA	83-1610-0925	12
000006		56007A042	A MINCOM	SHIELD-CAPSTAN MOTOR	83-3650-0600	1
000007		MS27183-8	MIL STD	WASHER-FLAT, GENERAL PURPSE, #10	83-9261-4006	4
000008		MS35338-43	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #10	83-9261-4307	4
000009		MIL-W-16878	NATL WIRE	WIRE-TYPE B, 22GA WHT NYLON JKT	83-7910-0043	AR

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE MOTOR ASSY-CAP,15-30IPS,60 HZ

CATALOG NO. 83-4560-0283

PL 56007B065-1

REV B

REF.DES./FIND #	---EFF--- BEG. END.	DRAWING NUMBER - MFGR PART NO.	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
-----------------	------------------------	-----------------------------------	-----------	-----------------------	-------------------	------

C64	413	200P1450	SPRAGUE	CAP-FXD,PLSTC, 2.UF 440V 10%	83-1510-4433	1
P8	413	1-480324-0	AMP INC	SHELL-CCNN,RECT, 15POSITION	83-1610-0933	1
000001	413	56007AC40-2	A MINCOM	MOTOR-CAPSTAN,15-30 IPS,60 CY	83-3560-0221	1
000002	413	56007B061	A MINCOM	BRACKET-CAPSTAN MOTOR MTG	83-3320-2426	1
000003	413	3-36-150E	SPRAGUE	BRACKET-CAPACITOR MTG,.750 WD	83-1320-1116	2
000004	413	MS16998-28	MIL STD	SCREW-CAP,SOE HD,10-32 X 5/8	83-9261-2102	4
000005	413	60618-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA	83-1610-0925	12
000006	413	56007BC42	A MINCOM	SHIELD-CAPSTAN MOTOR,MUMETAL	83-3650-0661	1
000007	413	MS27183-8	MIL STD	WASHER-FLAT,GENERAL PURPSE,#10	83-9261-4006	4
000008	413	MS35338-43	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#10	83-9261-4307	4
000009	413	MIL-W-16878	NATL WIRE	WIRE-TYPE B,22GA WHT NYLON JKT	83-7910-0043	AR

LAST OF 2 PAGES

M E G P A R T S L I S T

TITLE		MOTOR ASSY-CAP,15-30 IPS,50 HZ		CATALOG NO.	83-456C-0284	PL	560078065-2	REV	B
REF.DES./FIND #	---	FFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N .	PH CATALOG NUMBER	QTY.		
		PEG.	END.	- MEGR PART NO.					
C64		413	0V3020	SPRAGUE	CAP-FXD, 3 UF, 330 VAC	83-1510-4571	1		
P8		413	1-480324-0	AMP INC	SHELL-CCAN,RECT, 15POSITION	83-1610-0933	1		
000001		413	56007A040-4	A MINCOM	MOTOR-CAPSTAN,15-30 IPS, 50 CY	83-3560-0223	1		
000002		413	560078061	A MINCOM	BRACKET-CAPSTAN MOTOR MTG	83-3320-2426	1		
000003		413	3-36-150E	SPRAGUE	BRACKET-CAPACITOR MTG,.750 WD	83-1320-1116	2		
000004		413	MS16998-28	MIL STD	SCREW-CAP,SOC FD,10-32 X 5/8	83-9261-2102	4		
000005		413	60618-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA	83-1610-0925	12		
000006		413	560078042	A MINCOM	SHIELD-CAPSTAN MOTOR,MUMETAL	83-3650-0661	1		
000007		413	MS27183-8	MIL STD	WASHER-FLAT,GENERAL PURPSF,#10	83-9261-4006	4		
000008		413	MS3533P-43	MIL STD	WASHER-LOCK,SPLIT,HELICAL,#10	83-9261-4307	4		
000009		413	MIL-W-16878	NATL WIRE	WIRE-TYPE B,22GA WHT NYLON JKT	83-7910-0043	AR		

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/2 IN, 4 TRK, 7.5-15, 60 HZ

CATALOG NO. 83-5996-4000

PL 64000A001

REV B

REF. DES. / FIND # ---EFF--- DRAWING NUMBER MFG NAME DESCRIPTION PH CATALOG NUMBER QTY.
 REF. END. - MFG PART NO.

DS1, DS2, DS3, DS4, DS5, DS6 DS8	519 519	327 1820	GENERAL ELFC LAMP-INCANDESCENT, .04 AMP GF	83-1550-2506 83-1550-2602	6 1
L1, L2 L4 L5	519 519 519	42C24CC-AX 128264-001 42C24CC-AU	PHILLIPS CON SOLENOID-ELECTRICAL, PUSH/PULL LEDEX SOLENOID-POTARY PHILLIPS CON SOLENOID-ELECTRICAL, PUSH/PULL	83-1550-4516 83-1550-4514 83-1550-4513	2 1 1
P2	519	23013A085	A MINCOM CONN-PLUG, SHORTING, TAPE TRANS	83-4610-1136	1
000001	519	23013AC90-1	B MINCOM ARM ASSY-IDLER, ROLLER, LH	83-4210-0230	1
000002	519	23013A090-2	B MINCOM ARM ASSY-IDLER, ROLLER, RH	83-4210-0231	1
000003	519	23007AC50-1	K MINCOM ARM ASSY-IDLER, ACTUATING, RH	83-4210-0232	1
000004	519	23013A095	B MINCOM ARM ASSY-ACTUATOR, DOOR HD CVR	83-4210-0237	1
000005	519	23007A050-2	K MINCOM ARM ASSY-IDLER, ACTUATING, LH	83-4210-0256	1
000006	519	23007A040-1	D MINCOM ROLLER ASSY-IDLER, 1/2 IN INCOM	83-4240-0310	1
000007	519	23007A040-2	D MINCOM ROLLER ASSY-IDLER, 1/2 IN OTGNG	83-4240-0311	1
000008	519	23007A020-1	K MINCOM IDLER ASSY-REVERSING, 1/2 INCH	83-4240-0318	1
000009	519	23007AC30-1	D MINCOM DOOR ASSY-HEAD COVER, TPE TRANS	83-4330-0241	1
000010	519	23004A050	B MINCOM MOTOR ASSY-REWIND, REEL	83-4560-0092	1
000011	519	64007A060-1	A MINCOM MOT ASSY-CPSN, 7 1/2-15 IPS, 60HZ	83-4560-0299	1
000013	519	23004B000	B MINCOM MOTOR ASSY-TAKE UP REEL	83-4560-0237	1
000014	519	64013AC60	A MINCOM PCB ASSY-LOGIC TRANSPORT	83-4930-3065	1
000015	519	23007AC60-1	G MINCOM CAPSTAN ASSY-TAPE TRANS, 1/2 IN	83-5920-0819	1
000016	519	64013AC85	B MINCOM CHASSIS ASSY-TRANSPRT ELFC, 1/2	83-5920-1857	1
000017	519	23013AC46	C MINCOM ARM-DAMPENING, IDLER	83-3210-0223	1
000018	519	23013AC67	B MINCOM ARM-ACTUATOR, TAPELIFTER	83-3210-0253	1
000019	519	56007A001	C MINCOM FLYWHEEL-CAPSTAN DRIVE	83-3220-0293	1
000020	519	23013AC74	B MINCOM BUMPER-FUR SLV, .06 ID X .310LG	83-3230-0390	2
000021	519	23013A073	A MINCOM SPACER-MACHINFD, DAMPENER, TEF	83-3230-0391	1
000022	519	23013A077-1	MINCOM SHIM-TAPE GUIDE, .002 THK	83-3230-0401	AR
000023	519	23013AC77-2	MINCOM SHIM-TAPE GUIDE, .005 THK	83-3230-0402	AR

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,7.5-15,60 HZ

CATALOG NO. 83-5996-4000

PL 64000ACC1

REV B

REF.DES./FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	BEG. END.	- MFGR PART NO.				
000024	519	23013AC77-3	MINCOM	SHIM-TAPE GUIDE, .010 THK	83-3230-0403	AR
000025	519	23013AC77-4	MINCOM	SHIM-TAPE GUIDE, .020 THK	83-3230-0404	AR
000026	519	23013A192	A MINCOM	COLLAR-SPLINE, REEL HUB	83-3230-0440	2
000027	519	23013B013-2	A MINCOM	TAPE GUIDE-INCOMING, 1/2 IN	83-3240-0627	2
000028	519	23013B014-2	A MINCOM	TAPE GUIDE-OUTGOING, 1/2 IN	83-3240-0633	2
000029	519	23013A193	B MINCOM	BASE-REEL, HUB, SPINDLE	83-3240-0494	2
000030	519	19007A022	D MINCOM	CAP-FLYWHEEL, PRECISION PLATE	83-3250-0082	1
000031	519	230C7A023-2	C MINCOM	CAP-DECORATIVE	83-3250-0108	1
000032	519	23013B035	A MINCOM	SHAFT-ARM, IDLER	83-3280-0889	2
000033	519	23013A044	A MINCOM	SPRING-RETURN, IDLER ARM, CAPSTN	83-3280-0422	3
000034	519	23013C036		SHAFT-MTG, TAPE LIFTER	83-3280-0890	1
000035	519	23007AC54	A MINCOM	SPRING-SHOCK ABSORBING-IDLER	83-3280-0542	1
000036	519	23013B191	A MINCOM	SHAFT-SPINDLE, REEL HUB	83-3280-0861	2
000037	519	23013A020	A MINCOM	COVER-SWITCH, TAPE METERING	83-3310-0838	1
000038	519	23000A005-1	D MINCOM	COVER-TAPE DECK	83-3310-0995	1
000039	519	56007A055	C MINCOM	COVER-DUST, BELT DRIVE, TOP	83-3310-1437	1
000040	519	560C7B056	A MINCOM	COVER-DUST BELT DR, BOTTOM	83-3310-1649	1
000041	519	23007B003-1	A MINCOM	COVER-IDLER, SNAP-ON	83-3310-1572	1
000042	519	23007B003-2	A MINCOM	COVER-IDLER, SNAP-ON	83-3310-1573	1
000043	519	23013B015	A MINCOM	COVER-CAPSTAN, RH, DECORATIVE	83-3310-1576	1
000044	519	23013B032	A MINCOM	COVER-CAPSTAN, LH, DECORATIVE	83-3310-1577	1
000045	519	56CC7B005	A MINCOM	COVER-HEAD, TRIM	83-3310-1582	1
000046	519	56013B001	B MINCOM	COVER-LAMP, DECORATIVE	83-3310-1583	1
000047	519	23013A002	R MINCOM	PLATE-TAPE DECK, TRANSPORT	83-3320-1027	1
000048	519	23013A028	D MINCOM	BRACKET-MTG, SOLENOID, TPE TRANS	83-3320-1107	1
000049	519	23013A011	E MINCOM	BRACKET-MTG, SOLENOID, RH	83-3320-1108	1
000050	519	23013A047	A MINCOM	BRACKET-SOLENOID MTG, TAPE LIFT	83-3320-1167	1
000051	519	23013A021-2	C MINCOM	PLATE-MASKING, SWITCH, POWER	83-3320-1424	1
000052	519	23013A022-2	D MINCOM	PLATE-MASKING, SWITCH, CONTROL	83-3320-1425	1
000053	519	23013A173	B MINCOM	BRACKET-SUPPORT, PHOTO CELL	83-3320-1714	1
000054	519	23013A018-3	E MINCOM	TRIM-SWITCH PANEL	83-3330-0316	1
000055	519	23013A018-4	E MINCOM	TRIM-SWITCH PANEL, RH	83-3330-0317	1
000056	519	23013A025	A MINCOM	SUPPORT-DASHPOT, DECOR, HEAD COVER	83-3340-0382	1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,7.5-15,60 HZ

CATALOG NO. 83-5996-4000

PL 640COAC01

REV B

REF.DES./FIND #	---FFF--- BFG. ENC.	DRAWING NUMBER - MFG PART NO.	MFG NAME	D E S C R I P T I O N	PL CATALOG NUMBER	QTY.
000057	519	23013AC45	A MINCOM	SPACER-FWR SUP MTG,1.430 LG	83-3350-0412	1
000058	519	23013A055	A MINCOM	SPACER-COVER PLATE,TRANSPORT	83-3350-0414	2
000059	519	56CC7AC50	A MINCOM	BELT-DRIVE	83-3390-0047	1
000060	519	160498015-1	A MINCOM	LENS-INC LIGHT, *REWIND*	83-3550-1982	1
000061	519	160498015-2	A MINCOM	LENS-INC LIGHT, *FORWARD*	83-3550-1983	1
000062	519	23013AC05	C MINCOM	LENS-LAMP,TAPE SENSOR	83-3550-1406	2
000063	519	230138027	A MINCOM	LENS-LIGHTED SW,PR, POWER	83-3550-1980	1
000064	519	230138038	A MINCOM	LENS-INC LIGHT, *STOP*	83-3550-1981	1
000065	519	160498015-3	A MINCOM	LENS-INC LIGHT, *RECORD*	83-3550-1984	1
000066	519	160498015-4	A MINCOM	LENS-INC LIGHT, *PLAY*	83-3550-1985	1
000067	519	00000A741-3	E MINCOM	LABEL-IDENT,PATENT, MOD 23	83-3550-1500	1
000068	519	00000A769	C MINCOM	LABEL-IDENTIFICATION,MODULE	83-3550-1621	1
000070	519	AMF5DD-FS160	FAFNIR	BRG-BALL,ANLR,FLNCD,.3125 BORE	83-1230-0178	6
000071	519	303-85-15-1000	ELEC REGULTR	DASHPOT-AIR DAMPING CYLINDER	83-1270-0490	1
000072	519	303-85-15-1.25	ELEC REGULTR	DASHPOT-AIR DAMPING CYLINDER	83-1270-0491	1
000073	519	A-4030145-10	AMPEX	KNOB ASSY-EDITING, AUDIO TAPE	83-1270-0679	2
000074	519	A35	GENERAL ELEC	PHOTOELECTRIC CELL-LT ACTIVATE	83-1530-6020	1
000075	519	185-1873	DIALCO	LENS-CAP ASSY,1/2 IN SQ,AMBER	83-1550-5243	1
000076	519	185-1872	DIALCO	LENS-CAP ASSY,1/2 IN SQ,GREEN	83-1550-5244	1
000077	519	17460S	BELDON	CABLE ASSY-PWR,ELEC, 10 FT LG	83-1570-0303	1
000078	519	TRUARC	MIL STD	RING-RETAINING,EXT,.225 I.D.	83-7270-0118	1
000079	519	MS16633-1025	MIL STD	RING-RETAINING,TYPE E,1/4 IC	83-7270-0413	3
000080	519	5555-12	TRUARC	RING-RETNG, EXT, .120 ID	83-7270-0503	3
000081	519	GP67-125X500-12	GROOV-PIN	PIN-GRVC,HOLS,.125 DIA X.500LG	83-7280-0202	3
000082	519	21-S-C94-C437	STD PRSD STL	PIN-SPRING,.094 DIA X.437LG	83-7280-0223	2
000083	519	GP4-125X0500-12	GROOV-PIN	PIN-GRND,HOLS,.125 DIA X.500LG	83-7280-0484	3
000084	519	#775	H.H. SMITH	CLAMP-CABLE,NYLCN,.479 DIA	83-7650-0058	1
000085	519	23007AC44-1	A MINCOM	SHIM-IDLER,TAPE DRIVE,.002 THK	83-3230-0362	AR
000086	519	23007AC44-2	A MINCOM	SHIM-IDLER,TAPE DRIVE,.005 THK	83-3230-0363	AR
000087	519	23007AC44-3	A MINCOM	SHIM-IDLER,TAPE DRIVE,.010 THK	83-3230-0364	AR
000088	519	23007AC44-4	A MINCOM	SHIM-IDLER,TAPE DRIVE,.020 THK	83-3230-0365	AR
000089	519	56CC7AC12	A MINCOM	SCREW-REV IDLER,1/4-20 X 1.875	83-3260-0196	1
000090	519	23013AC64-1	C MINCOM	SCREW-MTG, TAPE GUIDE	83-3262-0537	4

MFG PARTS LIST

TITLE ASSY-1/2 IN, 4 TRK, 7.5-15, 60 HZ

CATALOG NO. 83-5996-4000

PL 64000A001

REV B

REF. DES. / FIND #	---EFF--- BEG. END.	DRAWING NUMBER - MFG PART NO.	MFG NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.
000091	519		NYLOCK	SCREW-MACH, FH, 100% 10-32 X 5/8	83-9260-0029	1
000092	519	F12NTEC-524	KAYNAR	NUT-SELF LKG, HEX, 5/16-24	83-9260-0186	3
000093	519	MS35206-237	MIL STD	SCREW-MACH, PAN HD, 6-32 X 1.750	83-9260-4544	1
000094	519	MS35206-261	MIL STD	SCR-MACH, PAN HD, 10-24 X 3/8 LG	83-9260-4588	2
000095	519	MS35190-223	MIL STD	SCREW-MACH, FH, 4-40 X 3/8	83-9260-6504	2
000096	1521	MS35190-240	MIL STD	SCREW-MACH, FH, 6-32 X 3/4	83-9260-6522	2
000097	1521	MS51017-26	MIL STD	SETSCREW-CUP PT, 6-32 X 1/2	83-9261-0051	2
000098	519			SCREW-STC, 8-32X1/4	83-9261-2057	4
000099	519	MS16598-29	MIL STD	SCREW-CAP, SOC HD, 10-32 X 3/4	83-9261-2103	2
000100	519	MS16598-31	MIL STD	SCREW-STC, 10-32X1	83-9261-2105	3
000106	519	MS35338-40	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #4	83-9261-4303	AR
000107	519	MS35338-41	MIL STD	WASHER-LOCK, SPLIT, #6	83-9261-4305	AR
000108	519	MS35338-42	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #8	83-9261-4306	4
000109	519	MS35338-43	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #10	83-9261-4307	AR
000110	519	MS35338-44	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #1/4	83-9261-4309	1
000111	519		MIL STD	SCREW-MACH, OVAL HD, 6-32 X 7/8	83-9261-4340	2
000112	519	AN960-416L	A & N STD	WASHER-FLAT, LIGHT SERIES, #1/4	83-9262-0046	5
000113	519			SCR-CAP, FH, 1/4X20X5/8, NYLOC	83-9262-0569	1
000114	519	1126	BIRNBACH	SPACER-RD, #6 SCREW SIZE, .375LG	83-9350-0099	2
000115	519	6593	BIRNBACH	INSULATOR-WASH, NYLON, .016 TK	83-9630-0272	AR
000116	519	23028AC50	B MINCOM	CABLE ASSY-PWR, 4TRK, 36 IN	83-4570-0346	1
000117	519	23000A010-4	MINCOM	CABLE ASSY-INTERCONN, HDS, 4 TRK	83-4570-0385	1
000118	519	64028AC40	A MINCOM	CABLE ASSY-STPCN XFMR, 4 TRACK	83-4570-0803	1
000119	519	64028A020-1	B MINCOM	CABLE ASSY-METER DISPLAY, 4 TRK	83-4570-0805	1
000120	519	23059A060	J MINCOM	P.C. BD ASSY-LNE AMP, SIG ELECT	83-4930-1091	4
000121	519	23059B030	A MINCOM	PC BD ASSY-CONVERSION, NAB, REC	83-4930-2961	4
000122	519	23059B040	G MINCOM	P.C. BD ASSY-RECORD, NAB	83-4930-1214	4
000123	519	23059A110	A MINCOM	P.C. BD ASSY-EXTENDER	83-4930-1746	1
000124	519	23059B090-1	H MINCOM	PC BD ASSY-PREAMP, OVDUB 7.5-15	83-4930-2180	4
000125	519	23059B020	C MINCOM	PC BD ASSY-BIAS ERASE	83-4930-2952	4
000126	519	64059AC10	C MINCOM	HSG ASSY-SIG ELECT, REC/REP	83-4930-2980	4
000127	519	64021A000-1	A MINCOM	PWR SUP ASSY-ELECT, 4 TRACKS	83-5920-1821	4
000128	519	23000B020-4	E MINCOM	HD SET ASSY-REC/REP/FRASE, 4 TK	83-5950-1230	1

M64 PAR 2-71

MFG PARTS LIST

TITLE		ASSY-1/2 IN,4 TRK,7.5-15,60 HZ		CATALOG NO.		83-5996-4000		PL 64000A001		RFV B	
REF. DES./FIND~#	---EFF---	DRAWING NUMBER	MFGR NAME	DESCRIPTION		PH CATALOG NUMBER		QTY.			
	BEG. END.	- MFG PART NO.									
000129	519	1120	SLIDE CO	PULLEY-CROOVE,NY,1.00 ODX3/8WD		83-1220-0331		4			
000130	519	#10	CALIF HDW	COUNTERBALANCE-WDC SASH, DUAL		83-1240-0648		2			
000131	519		ALLMETAL	PIN-DOWEL .250 X 1.250		83-1280-0225		2			
000132	519	23028AC10	A MINCOM	HINGE-PIVOT, CABINET, CONSOLE		83-3270-0560		2			
000133	519	23000AC03	A MINCOM	BAR-HINCE MTG, TRANSPORT		83-3290-0164		1			
000134	519	23028A039	MINCOM	HOUSING DISPLAY,METER,MOD 23		83-3310-0993		1			
000135	519	23028AC02	A MINCOM	BRKT-MTG, CABINET		83-3320-1415		2			
000136	519	23028A043	MINCOM	BRKT-SUP, CABINET		83-3320-1420		1			
000137	519	23000A001	C MINCOM	BRKT-MTG, TRANSPORT		83-3320-1421		4			
000138	519	23000AC04-1	A MINCOM	PLATE-MTG,SIDE, LH, TRANSPORT		83-3320-1422		1			
000139	519	23000A004-2	A MINCOM	PLATE-MTG,SIDE, RH, TRANSPORT		83-3320-1423		1			
000140	519	56028A914-1	A MINCOM	BRACKET-LIFTER,TRANSPORT,LH		83-3320-2342		1			
000141	519	56028A914-2	A MINCOM	BRACKET-LIFTER, TRANSPORT,RH		83-3320-2343		1			
000142	519	23028A033-3	A MINCOM	BRACKET-MTG, SIG ELECTRONICS		83-3320-2373		1			
000143	519	23028A033-4	A MINCOM	BRACKET-MTG, SIG ELECTRONICS		83-3320-2374		1			
000144	1521	23028A001	A MINCOM	TRIM-BAR, CABINET		83-3330-0314		1			
000145	519	23000AC02	C MINCOM	TRIM-ANGULAR, TRANSPORT		83-3330-0315		1			
000146	519	0000CA759	MINCOM	PLATE NAME UNIVERSAL		83-3330-0336		1			
000147	519	23028A005	C MINCOM	SUPPORT-TRANSPORT, CABINET		83-3340-0500		1			
000148	519	23028AC42	A MINCOM	SUPPORT-CHANNEL, TRANSPORT		83-3340-0506		1			
000149	519	56028A007-1	A MINCOM	SUPPORT-UPPER, LEFT		83-3340-0693		1			
000150	519	56028A007-2	A MINCOM	SUPPORT-UPPER, RIGHT		83-3340-0694		1			
000151	519	56028A913	A MINCOM	SUPPORT-CABLE,TRANSPORT LIFTER		83-3340-0733		1			
000152	519	18059A014	C MINCOM	SPACER-PANEL,SIGNAL ELECT		83-3350-0314		2			
000153	519	23028AC44	A MINCOM	SPACER-FLATE, TRANSPORT SUP		83-3350-0474		2			
000154	519	23028A023-2	A MINCOM	STOP-BAR,DOOR,CABINET CONSOLE		83-3350-0722		1			
000155	519	23028A015-2	A MINCOM	PANEL-FILLER, CONSOLE		83-3360-1428		1			
000156	519	56028AC38	A MINCOM	PANEL-FILLER, HOUSING		83-3360-1423		1			
000157	519	23028AC40-2	A MINCOM	PANEL-HOUSING, METER DISPLAY		83-3360-1664		1			
000158	519	00000A627-10	S MINCOM	LABEL-I.D.,M-23,PROFFESION REC		83-3550-1482		1			
000159	519	23059BC52	A MINCOM	METER-MICROVOLT,ILLUM DIAL		83-3550-3152		4			
000160	519	23028D035	A MINCOM	CABINET-FNCLOSURE,CSL,BLANK		83-3310-1681		1			
000161	519	A6732-5-3	ESNA	NUT-NON LKG,PL,10-32		83-9260-0059		16			

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,7.5-15,60 HZ

CATALOG NO. 83-5996-4000

PL 64C00A001

REV B

REF.	DES./FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
		RFG. END.	- MFGR PART NO.				

000162		519	MS35216-27	MIL STD	SCREW-MACH,PAN HD,6-32 X 1/2LG	83-9260-0156	4
000163		519	NAS1352-04-8	NAS STD	SCREW-CAP,SCC HD,4-40 X 1/2	83-9261-2003	2
000164		519	23007A018-1	A MINCOM	SHIM-CAPSTAN HOUSING,.002 THK	83-3230-0479	AR
000165		519	23007A018-2	A MINCOM	SHIM-CAPSTAN HOUSING,.003 THK	83-3230-0480	AR
000166		519	MS35190-234	MIL STD	SCREW-MACH,FH,6-32 X .250	83-9260-6515	2
000167		519	MS35190-236	MIL STD	SCREW-MACH,FH,6-32 X 3/8	83-9260-6517	2
000168		519	MS35207-268	MIL STD	SCREW-MACH,PAN HD,10-32X 1 1/4	83-9260-4579	4
000169		519	AN505-8R9	A & N STD	SCREW-MACH,FH,8-32 X 9/16	83-9260-6533	8
000171		519	MS35191-279	MIL STD	SCREW-MACH,FLAT HD,10-32 X 1.75	83-9260-6567	12
000172		519	NAS620-416	NAS STD	WASHER-FLAT,SM PATT,#1/4	83-9261-4043	4
000173		519	23028A049	A MINCOM	SPACER-TRANSFORMER, CONSOLE	83-3350-0711	2
000174		519			SCREW-WCCD, RD HD,#10 X 1.00LG	83-9262-0559	8
000175		519			SCREW-WCCD, RD HD,#6 X 7/8	83-9262-0555	4
000176		519			SCREW-WCCD, RND HD #8 X 7/8	83-9262-0556	7
000177		519			SCREW-WCCD, RND HD #10 X 7/8	83-9262-0558	8
000178		520	MS35495-127	MIL STD	SCREW-WCCD,RND HD,SLT,#14X1.25	83-9260-0227	4
000180		519	23013A040-1	D MINCOM	ARM ASSY-TAPE LIFTER,TRANSPORT	83-4210-0206	1
000181		519	GP7-125X1000-12	GROOV-PIN	PIN-GRVD,HDLS,.125 X 1.000 LG	83-7280-0212	1
000182		519	21FK-1032	STD PRSD STL	NUT-SELF-LOCKING,10-32 X 3/8	83-9260-2408	1

LAST OF 7 PAGES

163/164

M64 PAR 2-71

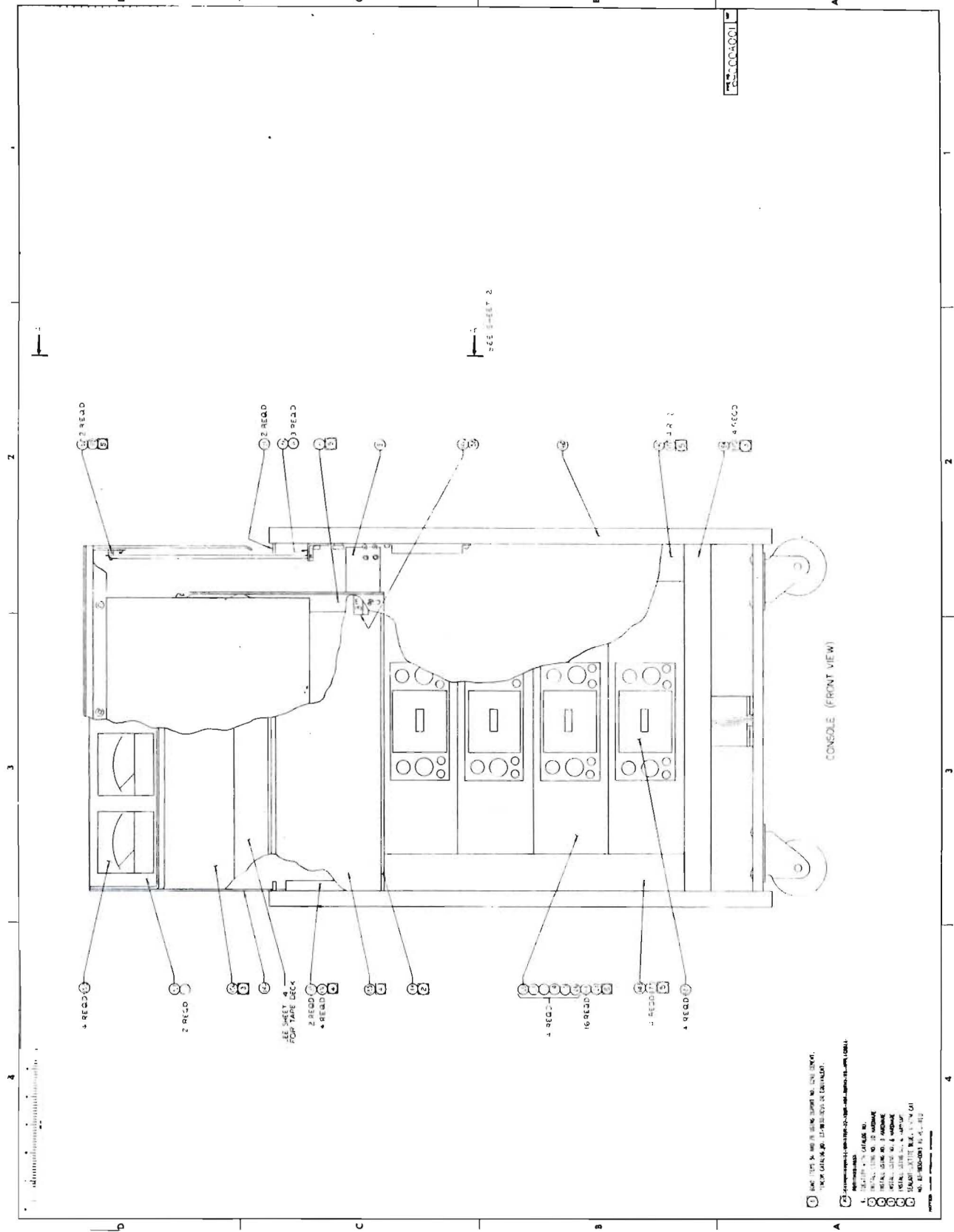


Figure 36. Tape Deck Assembly (Sheet 1 of 5)

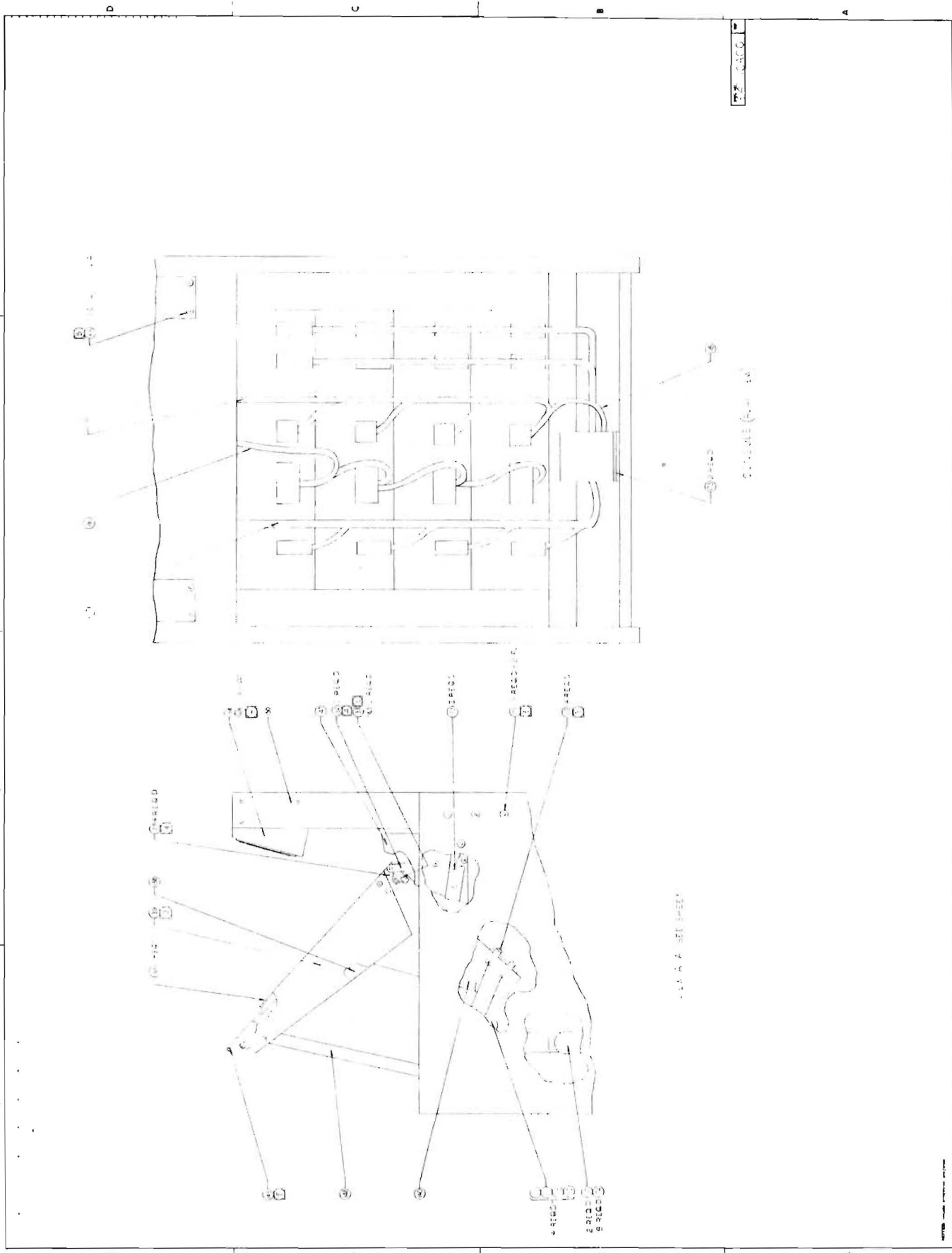


Figure 36. Tape Deck Assembly (Sheet 2 of 5)

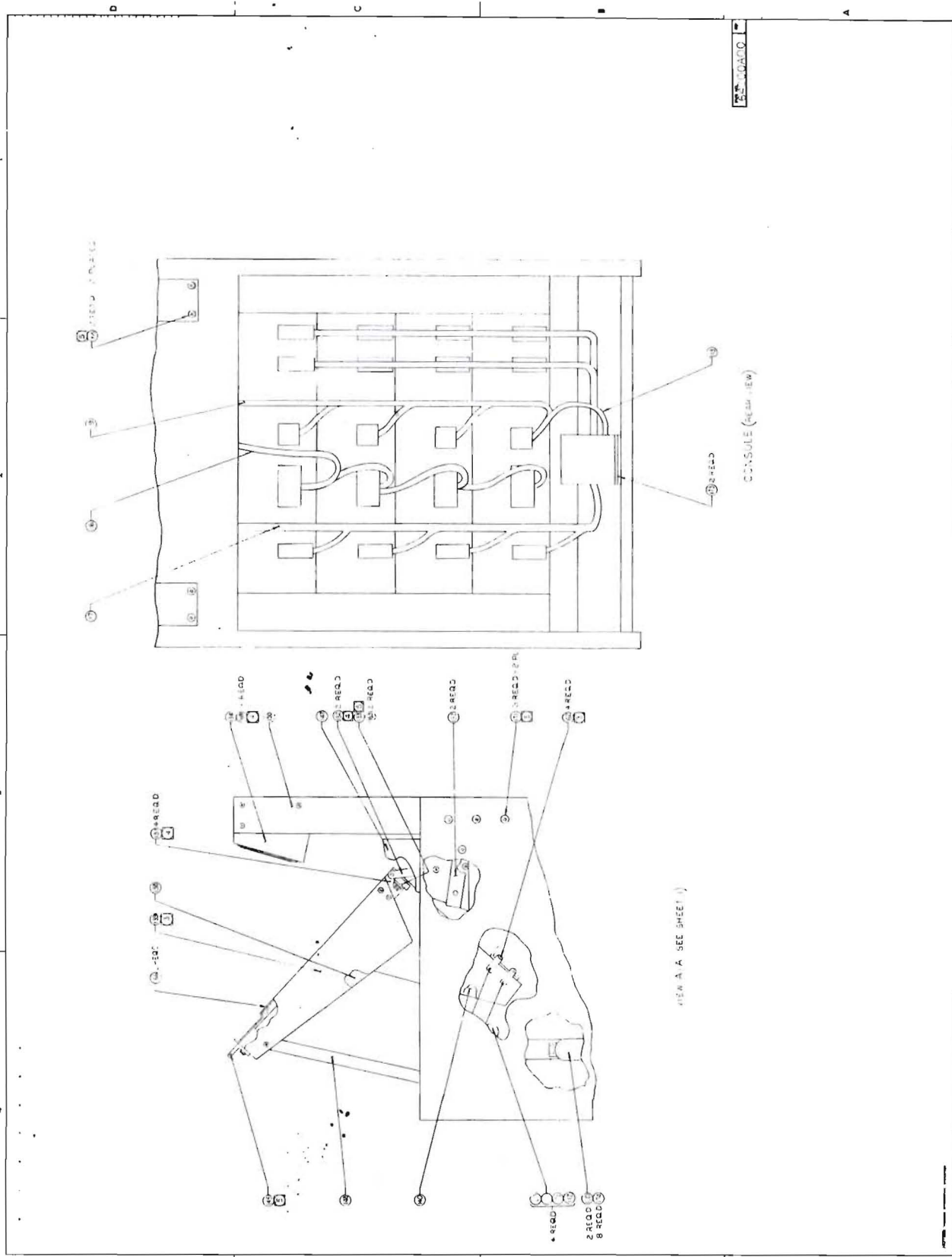
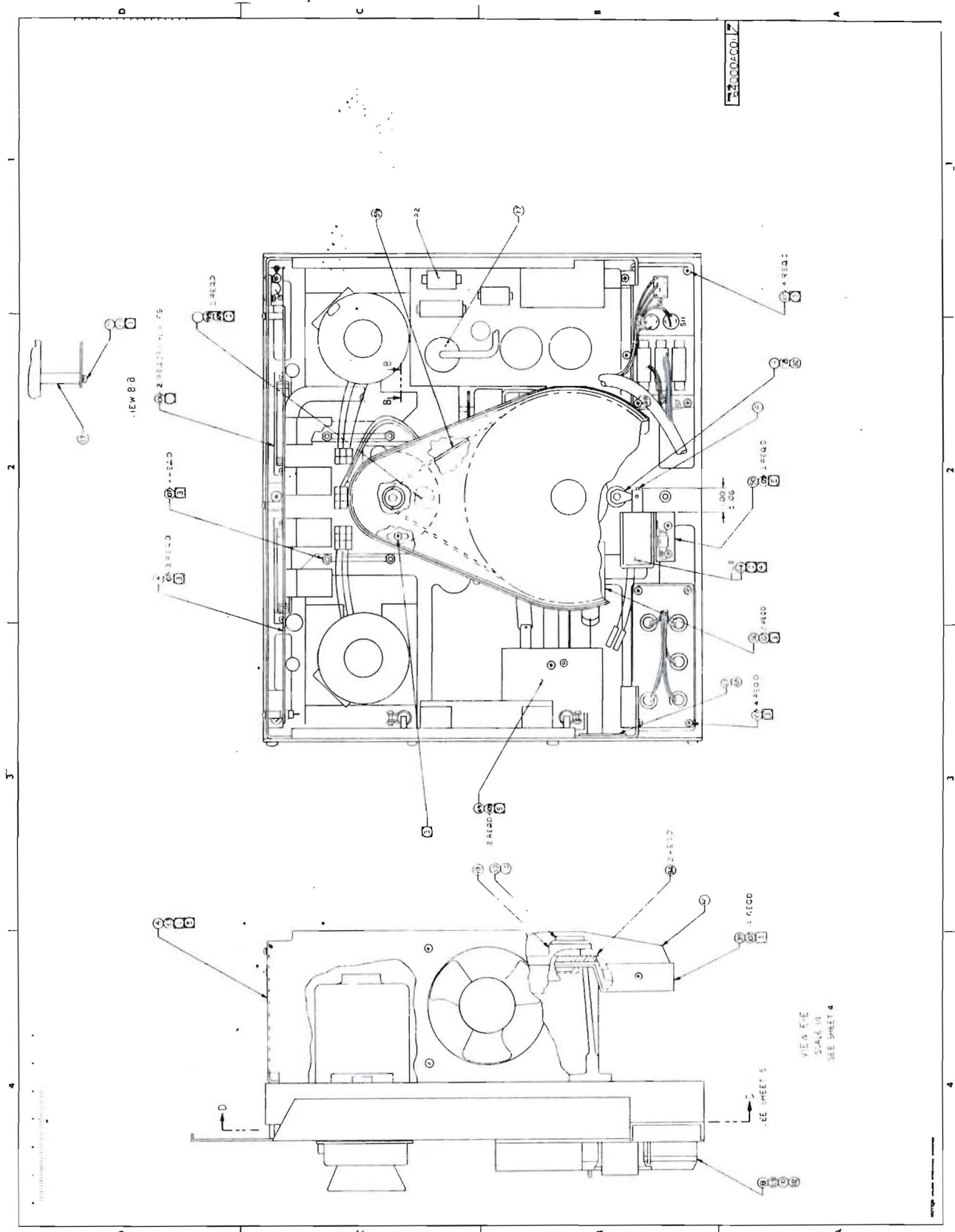


Figure 36. Tape Deck Assembly (Sheet 2 of 5)



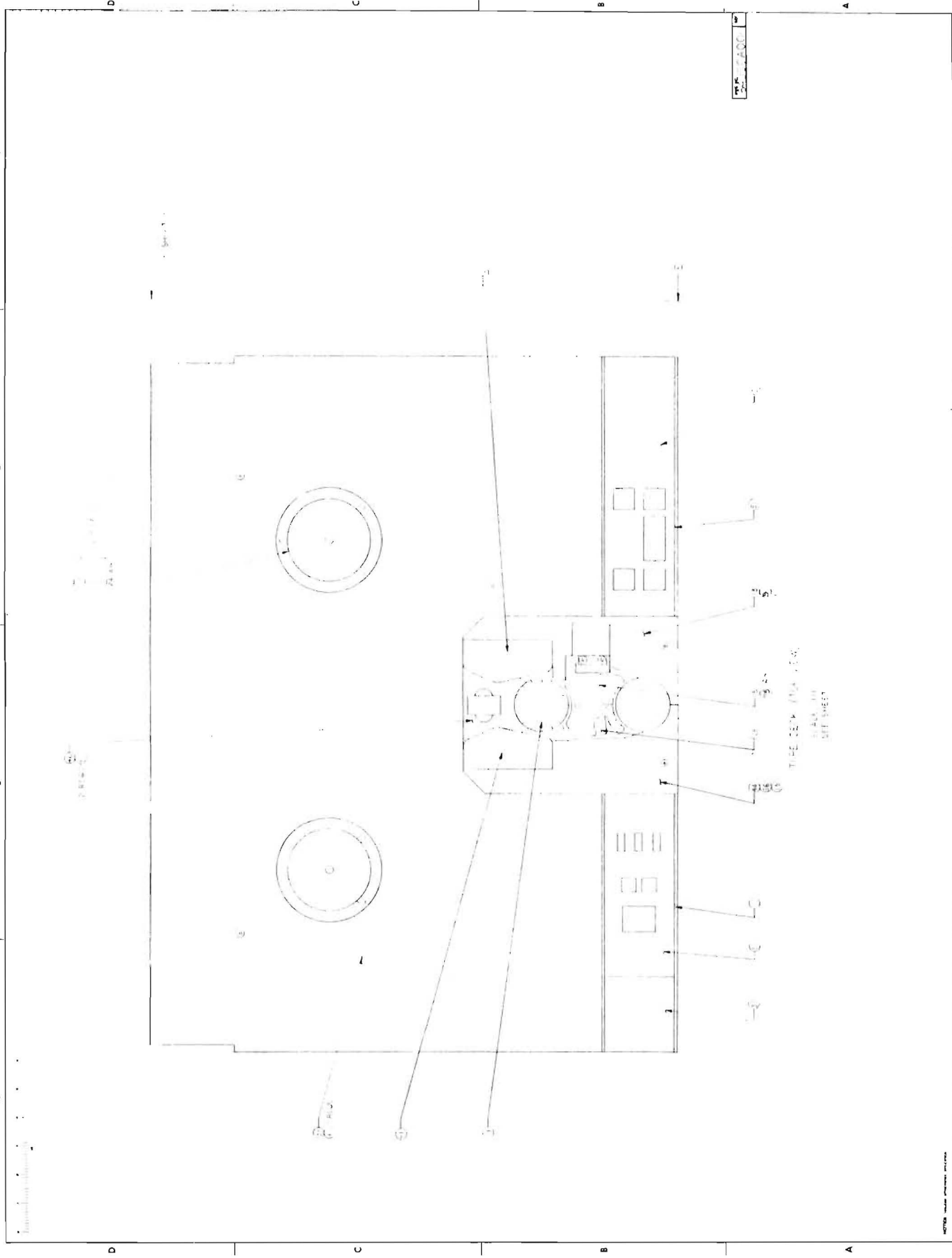


Figure 3b. Tape Deck Assembly (Sheet 4 of 5)

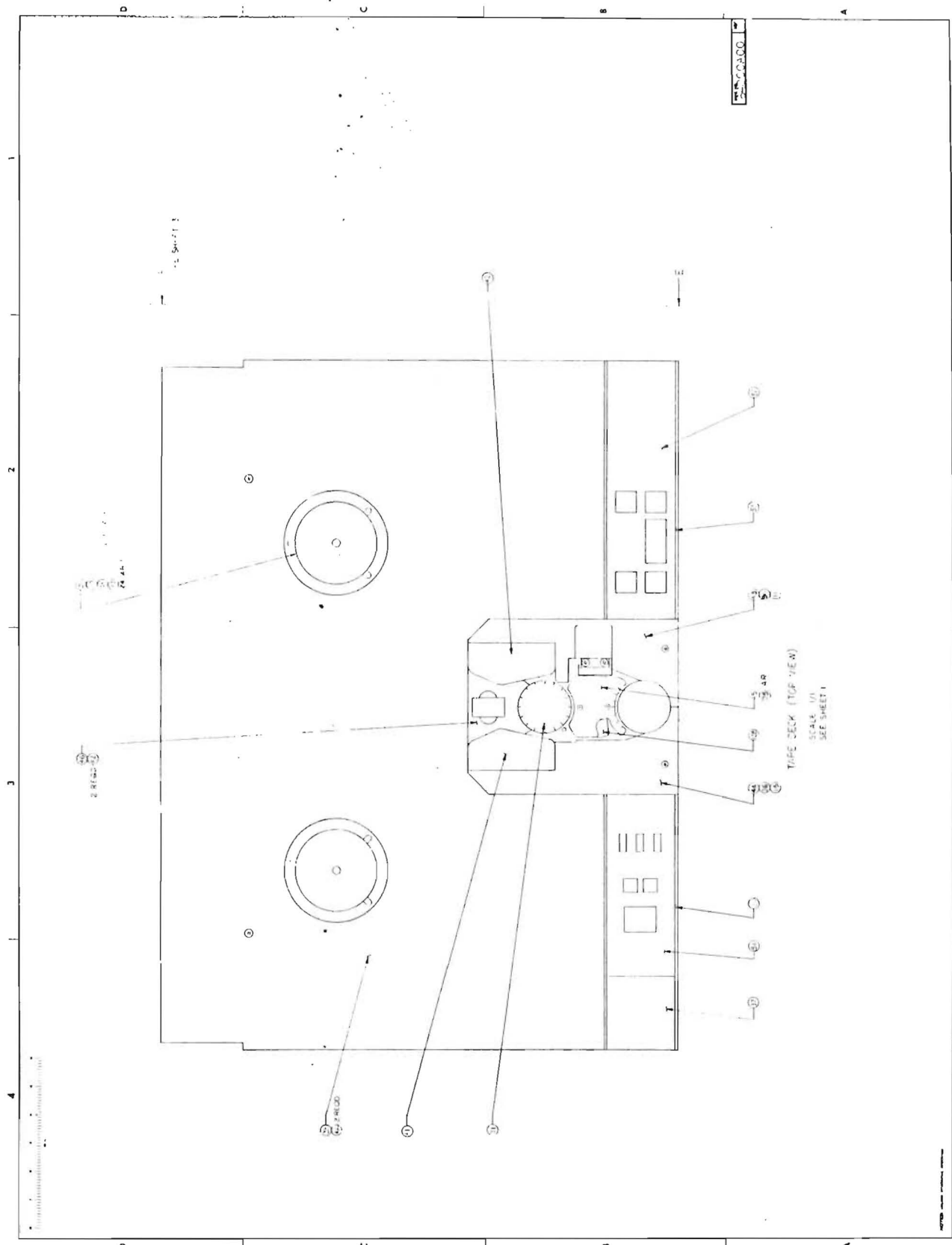


Figure 36. Tape Deck Assembly (Sheet 4 of 5)

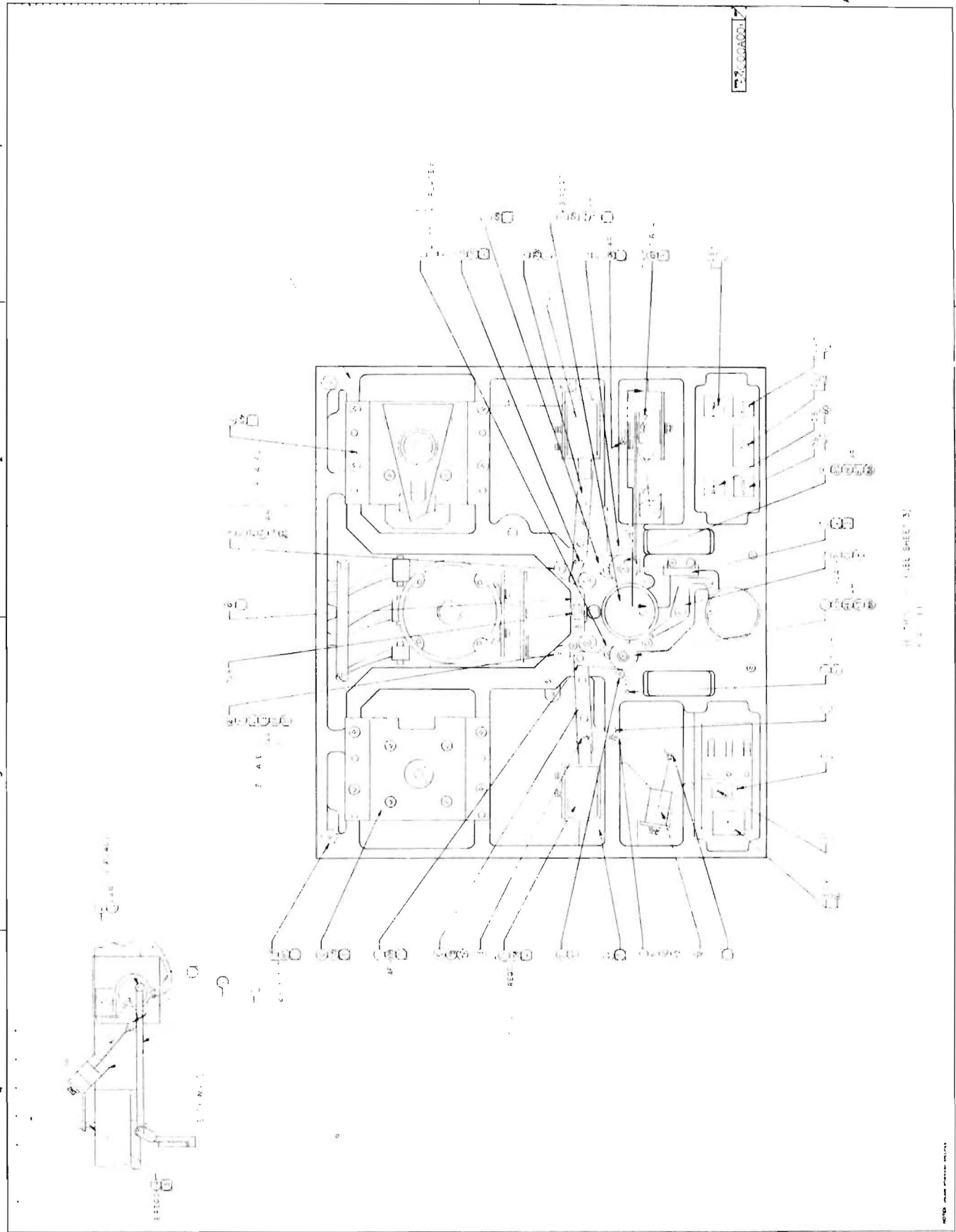


Figure 30. Tape Deck Assembly (Sheet 5 of 5)

M F G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,15-30,60 HZ

CATALOG NO. 83-5996-4001

PL 64000ACC2

REV B

REF.DES./FIND # ---EFF--- DRAWING NUMBER
 REF. ENC. - MEGR PART NO.

MEGR NAME

D E S C R I P T I O N

PH CATALOG NUMBER QTY.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000011

1531

64007AC60-3

A MINCOM

MOT ASSY-CPSN,15-30 IPS,60 HZ

83-4560-0300

1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,7.5-15,50 HZ CATALOG NO. 83-5996-4002 PL 6400A003 REV B

REF.DFS./FIND # ---EFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PR CATALOG NUMBER QTY.
REF. ENC. - MFGR PART NO.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000011	1531	64007AC60-2	A MINCOM	MOT ASSY-CPSN,7 1/2-15IPS,50HZ	83-4560-0301	1
000031	1531	230078023	A MINCOM	CAP-CAPSTAN STROBE, 50 HZ	83-3250-0183	1

M E G P A R T S L I S T

TITLE ASSY-1/2 IN,4 TRK,15-30,50 HZ

CATALOG NO. 83-5996-4003

PL 64C00A004

REV B

REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	PFG. FND.	- MEGR PART NO.				

SAME AS 84000A001 EXCEPT AS NOTED BELOW

000011	1531	64007A060-4	A MINCOM	MOT ASSY-CPSN,15-30 IPS,50 HZ	83-4560-0302	1
000031	1531	23007B023	A MINCOM	CAP-CAPSTAN STROBE, 50 HZ	83-3250-0183	1
000124	428	23059B090-2	H MINCOM	PC BD ASSY-PREAMP,OVERDUB15/30	83-4930-2511	4

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/4 IN,2 TRK,7.5-15,60 HZ

CATALOG NO. 83-5996-4004

PL 64000AC05

REV B

REF.DES./FIND # ---FFF--- DRAWING NUMBER MFGR NAME DESCRIPTION PH CATALOG NUMBER QTY.
 BFG. ENC. - MFGR PART NO.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000016	450	64013AC80	B MINCOM	CHASSIS ASSY-TRANSPT ELECT,1/4	83-5920-1856	1
000027	450	23013B013-1	A MINCOM	TAPE GUIDE-INCOMING,1/4 IN	83-3240-0626	2
000028	450	23013B014-1	A MINCOM	TAPE GUIDE-CUTTING,1/4 IN	83-3240-0632	2
000117	450	23000A010-2	MINCOM	CABLE ASSY-INTERCONN,HDS,2 TRK	83-4570-0383	1
000127	450	64031AC00-2	A MINCOM	PWR SUP ASSY-ELECT,2 TRACKS	83-5920-1822	2
000128	450	23000BC20-2	E MINCOM	HD SET ASSY-REC/REP/ERASE,2 TK	83-5950-1228	1
000142	450	64028A030-1	A MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2375	1
000143	450	64028AC30-2	A MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2376	1
000183	450	23028AC45-3	A MINCOM	PLATE-COVER,DISPLAY PANEL	83-3320-2359	2

M F G P A R T S L I S T

TITLE ASSY-1/4 IN, 2 TRK, 15-30, 60 HZ

CATALOG NO. 83-5996-4005

PL 64000A006

REV C

REF. DES. / FIND # ---EFF---

DRAWING NUMBER

MFGP NAME

D E S C R I P T I O N

PP CATALOG NUMBER QTY.

REG. FNC. - MFGP PART NO.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000011	1531	64007A060-3	A MINCOM	MOT ASSY-CPSN, 15-30 IPS, 60 HZ	83-4560-0300	1
000016	1527	64013AC80	B MINCOM	CHASSIS ASSY-TRANSPT ELECT, 1/4	83-5920-1856	1
000027	486	23013BC13-1	A MINCOM	TAPE GUIDE-INCOMING, 1/4 IN	83-3240-0626	2
000028	486	23013B014-1	A MINCOM	TAPE GUIDE-OUTGOING, 1/4 IN	83-3240-0632	2
000117	487	23000AC10-2	MINCOM	CABLE ASSY-INTERCONN, HDS, 2 TRK	83-4570-0383	1
000124	486	23059B090-2	H MINCOM	PC BD ASSY-PRFAMP, OVERDUB 15/30	83-4930-2511	2
000127	486	64031ACC0-2	A MINCOM	PWR SUP ASSY-ELECT, 2 TRACKS	83-5920-1822	2
000128	494	23000B020-2	E MINCOM	HD SET ASSY-REC/REP/ERASE, 2 TK	83-5950-1228	1
000142	487	64028AC30-1	A MINCOM	BRACKET-MTG, SIG ELECT CONSOLE	83-3320-2375	1
000143	487	64028A030-2	A MINCOM	BRACKET-MTG, SIG ELECT CONSOLE	83-3320-2376	1
000183	491	23028A045-3	A MINCOM	PLATE-COVER, DISPLAY PANEL	83-3320-2359	2

M64 PAR 2-71

M F G P A R T S L I S T

TITLE ASSY-1/4 IN,2 TRK,7.5-15,50 HZ

CATALOG NO. 83-5956-4006

PL 64CCCACC7

REV B

REF.DES./FIND # ---FFF--- DRAWING NUMBER MFGR NAME DESCRIPTION PH CATALOG NUMBER QTY.
 REG. FNC. - MFGR PART NO.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000011	1531	64007A060-2	A	MINCOM	MOT ASSY-CPSN,7 1/2-15IPS,50HZ	83-4560-0301	1
000016	1527	64013AC90	B	MINCOM	CHASSIS ASSY-TRANSPT ELECT,1/4	83-5920-1856	1
000027	486	23013B013-1	A	MINCOM	TAPE GUIDE-INCOMING,1/4 IN	83-3240-0626	2
000028	486	23013B014-1	A	MINCOM	TAPE GUIDE-CUTTING,1/4 IN	83-3240-0632	2
000031	1531	23007B023	A	MINCOM	CAP-CAPSTAN STROPE, 50 HZ	83-3250-0183	1
000117	487	23000AC10-2		MINCOM	CABLE ASSY-INTERCONN,HDS,2 TRK	83-4570-0383	1
000127	486	64031AC00-2	A	MINCOM	PWR SUP ASSY-ELECT,2 TRACKS	83-5920-1822	2
000128	494	23000B020-2	E	MINCOM	HD SET ASSY-REC/REP/FRASE,2 TK	83-5950-1228	1
000142	487	64028A030-1	A	MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2375	1
000143	487	64028A030-2	A	MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2376	1
000183	491	23028A045-3	A	MINCOM	PLATE-COVER,DISPLAY PANEL	83-3320-2359	2

M64 PAR 2-71

M F G P A R T S L I S T

TITL E ASSY-1/4 IN,2 TRK,15-30,50 HZ

CATALOG NO. 83-5296-4007

PL 64000A008

REV B

REF.DES./FIND # ---FFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
REG. END. - MFG PART NO.

SAME AS 64000A001 EXCEPT AS NOTED BELOW

000011	1531	64007A060-4	A MINCOM	MOT ASSY-CPSN,15-30 IPS,50 HZ	83-4560-0302	1
000016	1527	64013A080	B MINCOM	CHASSIS ASSY-TRANSPT ELECT,1/4	83-5920-1856	1
000027	486	23013B013-1	A MINCOM	TAPE GUIDE-INCOMING,1/4 IN	83-3240-0626	2
000028	486	23013B014-1	A MINCOM	TAPE GUIDE-OUTGOING,1/4 IN	83-3240-0632	2
000117	487	23000A010-2	MINCOM	CABLE ASSY-INTERCONN,HDS,2 TRK	83-4570-0383	1
000124	486	23059B090-2	H MINCOM	PC BD ASSY-PREAMP,OVERDUB15/30	83-4930-2511	2
000127	486	64031A000-2	A MINCOM	PWR SUP ASSY-ELECT,2 TRACKS	83-5920-1822	2
000128	494	23000B020-2	F MINCOM	HD SET ASSY-RFC/REP/ERASE,2 TK	83-5950-1228	1
000142	487	64028A030-1	A MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2375	1
000143	487	64028A030-2	A MINCOM	BRACKET-MTG,SIG ELECT CONSOLE	83-3320-2376	1
000183	491	23028A045-3	A MINCOM	PLATE-COVER,DISPLAY PANEL	83-3320-2359	2

M64 PAR 2-71

M E G P A R T S L I S T

TITLE PCB ASSY-LOGIC TRANSPORT		CATALOG NO. 83-4930-3065		PL 640134060		REV A	
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PF CATALOG NUMBER	QTY.
	REG. FND.	- MEGR PART NO.					
C1	450	TC2501	MALLORY	CAP-FXD,ELECT,	100UF 50V	83-1510-2045	1
C3	450	BR250-50	CORNELL DUBL	CAP-FXD,FLECT,	250UF 50V	83-1510-2031	1
C4,C5,C6	450	TYPE P123ZNP	AERVOIX	CAP-FXD,PAPER	.47UF 400V 20%	83-1510-4072	3
C7	450	TS05-20-686	COMP INC	CAP-FXD,TA,	68UF 20V 20%	83-1510-6211	1
C8,C9	450	TYPE P123ZNP	AERVOIX	CAP-FXD,PAPER,	.01UF 200V 25%	83-1510-4046	2
C10	450	0A836-5086	MINCOM SPEC	CAP-FXD,MICA,9100	UF 500V 5%	83-1510-5086	1
C11	450	313-M	ARCO	CAP-VAR,MICA,1000-2155PF	500V	83-1510-5001	1
C12	450	0D475XSC3532	SPRAGUE	CAP-FXD,TA,	4.7UF 35V 10%	83-1510-6095	1
CR1,CR3,CR4,CR6, CR7,CR8,CR9, CR10,CR13,CR14, CR15,CR16,CR17, CR18,CR19,CR20, CR21,CR24,CR25, CR26,CR27,CR28, CR29,CR30,CR31, CR32,CR37,CR38, CR39,CR40,CR41, CR46,CR47,CR48, CR49	480	IN4004	MOTOROLA	RECT-SI,DIF JCT,400PIV	1 AMP	83-1530-0151	31
CR50,CR51	450	MR1033A	MOTOROLA	RECT-SI, 300 PRV, 3.0 AMP		83-1530-0364	4
CR52,CR53	450	IN4750A		DIODE-SI,ZENER, 27 V, 1 W, 5%		83-1530-0439	2
	450	IN3002	MOTOROLA	DIODE-SI,ZENER, 75V 33 MA		83-1530-0301	2
F1	482	312004.	LITTELFUSE	FUSE-QUICK ACT,250V 4 AMP		83-7550-R016	1
K1,K2,K3,K4,K5, K6,K7,K8	450	KHP17D12-24	PCT & BRUMFO	RELAY-4FCT, 24 VDC 650 OHM		83-1550-3678	8
Q1,Q2,Q3	450	2N3053	R.C.A.	TSTR-SI,NPN, PWR,	60 VCR	83-1530-2180	3
R1	450	0A781-7331	MINCOM SPEC	RES-FXD,FILM,27 OHM,1/2W,2% S		83-1520-7331	1
R5	450	0A781-7221	MINCOM SPEC	RES-FXD,FILM,100 OHM,1/2W,2% S		83-1520-7221	1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE PCB ASSY-LOGIC TRANSPORT

CATALCG NO. 83-4930-3065

PL 64013A060

REV A

REF.DES./FIND #	---EFF--- BEG. END.	DRAWING NUMBER - MFG PART NC.	MFG NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
R6	450	1720	OHMITE	RES-FXD, WW,100 OHM 10W 5%	83-1520-8253	1
P7	450	0A781-7335	MINCOM SPEC	RES-FXD,FILM,39 OHM,1/2W,2%	83-1520-7335	1
R8	450	1730	OHMITE	RES-FXD, WW,500 OHM 10W 5%	83-1520-8007	1
R9	450	LITTLE DEVIL	OHMITE	RES-FXD,COMP,100 OHM 2W 5%	83-9520-5520	1
R10,R11	450	LITTLE DEVIL	OHMITE	RES-FXD,COMP,270 OHM 1W 5%	83-9520-4091	2
R12,R13	450	LITTLE DEVIL	OHMITE	RES-FXD,COMP,2.7 OHM 1W 5%	83-9520-4000	2
R14	450	LITTLE DEVIL	OHMITE	RES-FXD,COMP,1.2K OHM 1W 5%	83-9520-4153	1
R15	450	0A781-7355	MINCOM SPEC	RES-FXD,FILM,560 OHM,1/2W,2%	83-1520-7355	1
R16	450	LITTLE DEVIL	OHMITE	RES-FXD,COMP,150 OHM 1W 5%	83-9520-4134	1
R17,R18	450	0A781-7337	MINCOM SPEC	RES-FXD,FILM,47 OHM,1/2W,2%	83-1520-7337	2
R19,R20	450	0A781-7147	MINCOM SPEC	RES-FXD,FILM,4.7K OHM,1/2W,2%	83-1520-7147	2
R21,R22	450	0A781-7375	MINCOM SPEC	RES-FXD,FILM,33K OHM,1/2W,2%	83-1520-7375	2
R23	450	0A781-7325	MINCOM SPEC	RES-FXD,FILM,10 OHM,1/2W,2%	83-1520-7325	1
T1	450	00000A721	B MINCOM	XFMR-TORROIDAL,ARNOLD CORE	83-3540-1153	1
000001	450	9KH2	PCTTR & BRUM	SOCKET-RELAY,14 PIN	83-1620-0184	8
000002	450	23013BC61	A MINCOM	PC3460-LOGIC TRANSPORT	83-3640-1962	1
000003	450			NUT-HEX,SM PATT,6-32 X .250 WD	83-9260-2202	2
000004	484	64013A061	A MINCOM	LABEL-IC, LOGIC TRANSPORT	83-3550-1977	1
000005	450			SCREW-MACH,PAN HD,6-32 X 2 1/4	83-9260-4594	2
000006	450			WASHER-FLAT,SM PATT,#6	83-9261-4013	2
000007	450	MS3523E-41	MIL STD	WASHER-LOCK,SPLIT, #6	83-9261-4305	5
000010	450	2515	H.H.SMITH	INSULATOR-WASH, NYLON,#6	83-9630-0268	6
000011	450	#EXE-22-122	THERMAX	WIRE-TYPE C,22GA WHT TEFLN JKT	83-7910-0476	AR
000012	450	KHP	POTTER/BRUMF	SPG-HOLD DOWN,RELAY	83-1280-0571	8
000013	450	MS35206-227	MIL STD	SCREW-MACH,PAN HD,6-32 X 5/16	83-9260-4530	3
000014	450	MS27183-6	MIL STD	WASHER-FLAT,GENERAL PURPOSE,#6	83-9261-4004	3
000015	450	8070-E	LERCO	SPACFR-SLV, HEX, TAP, .500 LG	83-9350-0063	3
000016	450	4405	BUSSMANN MFG	FUSEHOLDER-BLOCK,AG 3 FUSE	83-1620-0001	1
000017	450	MS35206-215	MIL STD	SCREW-MACH,PAN HD,4-40 X 3/8	83-9260-4515	1
000018	450			WASHER-FLAT,.219 OD X .125 ID	83-9261-4012	1
000019	450	MS35335-29	MIL STD	WASHER-LOCK,FLAT,EXT T,#4	83-9261-4101	1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE PCB ASSY-LOGIC TRANSPORT

CATALOG NO. 83-4930-3065

PL 64013A060

REV A

REF.DES./FIND #	---FFF--- BEG. END.	DRAWING NUMBER - MFG PART NO.	MFG NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
000020	450			WASHER-FLAIN,.125 ID X.18700	83-9630-0115	1
000021	450			NUT-HEX,SM PATT,4-40 X .198 WD	83-9260-2201	4
000022	450	3025-005	3M	TUBING-CLEAR VINYL,.047 ID	83-7910-0272	AR
000023	450	10160-DAP	MILTON ROSS	PAD-TRANSISTOR,FOR TO-5 CASES	83-9690-0145	1
000024	450	7856	WALSCO	INSULATOR-WASHER,.140 ID	83-9630-0036	4
000025	450	2514	HF SMITH	WASHER-NYLON,FLAT,FOR #4 SCREW	83-9630-0435	1
000026	450	MS35206-238		SCREW-MACHINE,FAN HD,6-32X2.00	83-9260-4607	2

LAST OF 4 PAGES

MFG PARTS LIST

TITLE CHASSIS ASSY-TRANSP ELECT,1/4		CATALOG NO. 83-5920-1856		PL 64013A080		REV B	
RFF.DFS./FIND #	---EFF--- PFG. FND.	DRAWING NUMBER - MFGR PART NO.	MFGR NAME	DESCRIPTION	PL CATALOG NUMBER	QTY.	
000023	460		NATL WIRE	WIRE-TYPE B,20GA WHT NYLON JKT	83-7910-0035	AR	
000024	460		NATL WIRE	WIRE-TYPE B,20GA BLK NYLON JKT	83-7910-0039	AR	
000025	460	MIL-W-16878	NATL WIRE	WIRE-TYPE B,22GA WHT NYLON JKT	83-7910-0043	AR	
000026	460		NATL WIRE	WIRE-TYPE B,22GA WHT NYLON JKT	83-7910-0052	AR	
000027	460	#FXF-22-122	THERMAX	WIRE-TYPE C,22GA WHT TEFLN JKT	83-7910-0476	AR	
000028	460	#FXF-20-120	THERMAX	WIRE-TYPE C,20GA WHT TEFLN JKT	83-7910-0496	AR	
J2,J4	506	1-480275-0	AMP INC	SHELL-CONN,RECT, .650 WDX1.045	01 83-1610-0932	2	
J5,J6	506	2VK180/1-2	VIKING	CONN-P.C.,ELEC,PIERCD, 36 CON	01 83-1610-0782	2	
J7	508	1-480273-0	AMP INC	SHELL-CONN,RECT,.565 WDX.65	01 83-1610-0923	1	
J8	506	1-480323-0	AMP INC	SHELL-CONN,RECT, .650WDX1.280	01 83-1610-0934	1	
J9	506	1-480274-0	AMP INC	SHELL-CONN,RECT,.65 WD X.805	01 83-1610-0924	1	
J11	506	1-480304-0	AMP INC	SHELL-CONN,RECT, 3 POSITION	01 83-1610-1137	1	
P11	506	1-480305-C	AMP INC	SHELL-CONN,RECT,3 POS	01 83-1610-1142	1	
S1,S2,S3,S4,S5	508	1018	PENDAR	SWITCH-PUSHBUTTON,SPDT,LIGHTED	01 83-1550-5148	5	
S6	506		LIKON	SWITCH-ALTERNATE ACT,ILLUM	01 83-1550-5231	1	
S7,S9	506	TYPE SS16	STACKPOLE	SWITCH-SLIDE,DPTT	01 83-1550-5232	2	
S8	506	TYPE SS12	STACKPOLE	SWITCH-SLIDE,4PDT	01 83-1550-5230	1	
S10,S11	506	513-0101-604	DIALCO	SWITCH-MOMENTARY,MAKE	01 83-1550-5233	2	
S12	506	MS24547-1	MIL STD	SWITCH-BASIC,SPDT,28VDC 7 AMP	01 83-1550-5067	1	
000002	506	23013A017	B MINCOM	CHASSIS-SWITCH MTG,TRANSPORT	01 83-3310-0708	1	
000004	506	23013A016	C MINCOM	PLATE-SWITCH MTG,TRANSPORT	01 83-3320-1115	1	
000011	506	42993-1	AMP INC	CONTACT-ELEC,SOC, 16 SIZE	01 83-1610-0678	13	
000012	506	42991-1	4 AMP INC	SOCKET-CONTACT,CONN, SIZE 16	01 83-1610-0689	8	
000013	506	60618-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA	01 83-1610-0925	2	
000014	506	60510-4	AMP INC	CONTACT-ELEC,SOC,18-22GA SIZE	01 83-1610-0927	44	
000018	506	3006	F.H. SMITH	TERM BC-2.250 BETWEEN MTG HALF	01 83-1640-0588	2	
000020	506	RBP53	THOMS & BETS	TERM-LUG, INSUL,R TG, .31WD	01 83-9630-0206	2	
000030	506	RA853	THOMS & BETS	TERM-LUG, INSUL,R TG,.26WD	01 83-9630-0203	2	
000031	506	RAP73	THOM & BETTS	LUG-TERMINAL SOLDERLS,RING,#10	01 83-9630-0205	4	

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CHASSIS ASSY-TRANSP FLECT, 1/4

CATALOG NO. 83-5920-1856

PL 64013A080

REV B

REF.DES./FIND #	---FFF--- BEG. END.	DRAWING NUMBER - MFG PART NO.	MFG NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
-----------------	------------------------	----------------------------------	----------	-----------------------	-------------------	------

CR77	506	IN4004	MOTOROLA	RECT -SI, DIF JCT, 400PIV 1 AMP	02 83-1530-0151	1
K13	506	KHP17D12-24	POT & BRUMED	RELAY-4PDT, 24 VDC 650 OHM	02 83-1550-3678	1
R75	506	1723	OHMITE	RES-FXD, WW, 200 OHM 10W 5%	02 83-1520-8006	1
R76	506	LITTLE DEVIL	CHMITE	RES-FXC, COMP, 470 OHM 2W 5%	02 83-9520-5528	1

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CHASSIS ASSY-TRANSPT ELECT,1/4		CATALOG NO. 83-5920-1856	PL 64C13A080	REV B
REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N
	REF. END.	- MEGR PART NO.		PH CATALOG NUMBER QTY.
000037	506	23013AC69	MINCOM	BRACKET-SUPPORT,DELAY RELAY
000038	506	9KH1	PCT.BRUM	SOCKET-RELAY,14CCNT
				02 83-3320-1686 1
				02 83-1620-0108 1

M64 PAR 2-71

187/188

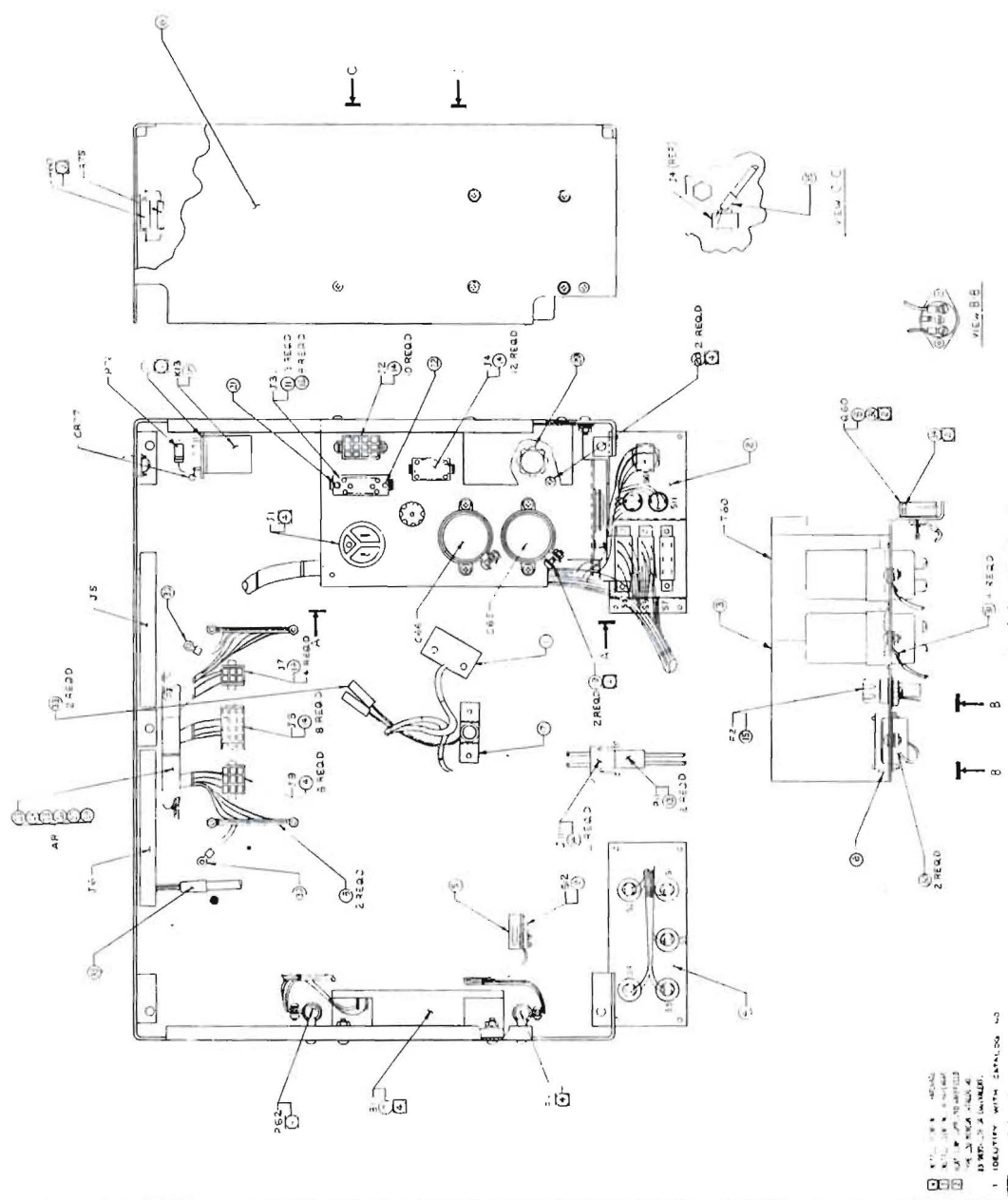


Figure 37. Remote Control Assembly

M F C P A R T S L I S T

TITLE CHASSIS ASSY-TRANSP ELECT, 1/2 CATALOG NO. 83-592C-1857 PL 64013A085 REV B
 REF.DES./FIND # ---EFF--- DRAWING NUMBER MFCR NAME DESCRIPTION PH CATALOG NUMBER QTY.
 BFG. END. - MFCR PART NO.

USE PART LIST AND DRAWING 64013A080 FOR PARTS AND PART NUMBERS.

ASSEMBLY 64013A085 DOES NOT CONTAIN CR77, K13, R75, R78, AND FIND NO's 37 AND 38

M64 PAR 2-71

M F G P A R T S L I S T

TITLE CABLE ASSY-METER DISPLAY,4 TRK

CATALOG NO. 83-457C-08C5

PL 64028A02C-1

REV B

REF.DES./FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
BFG. FND.		- MFGR PART NO.				
000001		7-07	LEECRAFT	LAMPHOLDER-MINTR BAYONET, 3 1/4	83-1620-0258	8
000002		1-480276-0	AMP INC	SHELL-CANN, RECT, .665 WD X.850	83-1610-0929	4
000003		60618-4	AMP INC	CONTACT-ELEC, PIN, .084 DIA	83-1610-0925	16
000004			NATL WIRE	WIRE-PVC, TYPE B, 22GA YELLOW	83-7910-0040	AR
000005			NATL WIRE	WIRE-TYPE B, 22GA VIO NYLON JKT	83-7910-0041	AR
000006			NATL WIRE	WIRE-PVC, TYPE B, 22GA GRAY	83-7910-0042	AR
000007			NATL WIRE	WIRE-TYPE B, 22GA BLU NYLON JKT	83-7910-0044	AR
000008				WIRE-TYPE B, 22 GA, VIOLET-WHITE	83-7910-0068	AR
000009			ALTO LITE	WIRE-TYPE B, 22GA GR/WT NYL JKT	83-7910-0170	AR
000010			NATL WIRE	WIRE-TYPE B, 22GA, GRN NYLN JKT	83-7910-0248	AR
000011			NATL WIRE	WIRE-TYPE B, 22GA RED NYLON JKT	83-7910-0249	AR
000012			NATL WIRE	WIRE-TYPE B, 22 GA ORNG NYL JKT	83-7910-0250	AR
000013			NATL WIRE	WIRE-TYPE B, 22GA, BRN NYLN JKT	83-7910-0251	AR
000014				WIRE-TYPE B, 22 GA YELLOW NYLN	83-7910-0259	AR
000015				WIRE TYPE B, 22 GA GRAY NYLN	83-7910-0261	AR
000016				WIRE-TYPE B, 22 GA RED NYLN JKT	83-7910-0264	AR
000017				WIRE-TYPE B, 22 GA BLU NYLN JKT	83-7910-0288	AR
000018				WIRE-TYPE B, 22GA BRN NYLN JKT	83-7910-0301	AR
000019				WIRE-TYPE B, 22 GA ORN NYLN JKT	83-7910-0303	AR
000020		RA873	THOM & BETTS	LUG-TERMINAL SOLDERLS, RING, #10	83-9630-0205	8
000021		3025-090	3M	TUBING-SCOTCHTITE, 7/16 ID	83-7910-0281	AR

LAST OF 2 PAGES

M64 PAR 2-71

M E G P A R T S L I S T

TITLE CABLE ASSY-METER DISPLAY,2 TRK		CATALOG NO.	83-457C-0806	PL	64028AC2C-2	REV	B
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N		PH CATALOG NUMBER	QTY.
	REF. FND.	- MEGR PART NO.					
000001		7-07	LEECRAFT	LAMPHOLDER-MINTP BAYCNET,3 1/4		83-1620-0258	4
000002		1-480276-0	AMP INC	SHELL-CCNN,RECT, .665 WD X.850		83-1610-0929	2
000003		60618-4	AMP INC	CONTACT-ELEC,PIN, .084 DIA		83-1610-0925	8
000004			NATL WIRE	WIRE-PVC,TYPE B, 22GA YELLOW		83-7910-0040	AR
000005			NATL WIRE	WIRE-TYPE B,22GA VIO NYLON JKT		83-7910-0041	AR
000006			NATL WIRE	WIRE-PVC, TYPE B, 22GA GRAY		83-7910-0042	AR
000007			NATL WIRE	WIRE-TYPE B,22GA BLU NYLON JKT		83-7910-0044	AR
000008				WIRE-TYPE B,22 GA,VIOLET-WHITE		83-7910-0068	AR
000009			ALTOLITE	WIRE-TYPE B,22GA GR/WT NYL JKT		83-7910-0170	AR
000010			NATL WIRE	WIRE-TYPE B,22GA,GRN NYLN JKT		83-7910-0248	AR
000011			NATL WIRE	WIRE-TYPE B,22GA RED NYLON JKT		83-7910-0249	AR
000012			NATL WIRE	WIRE-TYPE B,22 GA ORNG NYL JKT		83-7910-0250	AR
000013			NATL WIRE	WIRE-TYPE B,22GA,BRN NYLN JKT		83-7910-0251	AR
000014				WIRE-TYPE B,22 GA YELLOW NYLN		83-7910-0259	AR
000015				WIRE TYPE B,22 GA GRAY NYLN		83-7910-0261	AR
000016				WIRE-TYPE B,22 GA RED NYLN JKT		83-7910-0264	AR
000017				WIRE-TYPE B,22 GA BLU NYLN JKT		83-7910-0288	AR
000018				WIRE-TYPE B,22GA BRN NYLN JKT		83-7910-0301	AR
000019				WIRE-TYPE B,22 GA ORN NYLN JKT		83-7910-0303	AR
000020		RA873	THOM & BETTS	LUG-TERMINAL SOLDERLS,RING,#10		83-9630-0205	4

LAST OF 2 PAGES

M64 PAR 2-71

M F G P A P T S L I S T

TITLE	CABLE ASSY-STPDN XFMR, 4 TRACK	CATALOG NO.	83-4570-C803	PL	64028A040	REV	A
REF. DES. / FIND #	---EFF---	DRAWING NUMBER	MFGR NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.	
REF. END.	REF. END.	- MFGR PART NO.					
EJ4		1-480275-0	AMP INC	SHELL-CCNN, RECT, .650 WDX1.045	83-1610-0932	1	
EP4		1-480278-0	AMP INC	SHELL-CCNN, RECT, 12 POSITIONS	83-1610-0931	1	
J109		1-480273-0	AMP INC	SHELL-CCNN, RECT, .565 WDX.65	83-1610-0923	4	
P109		1-480276-0	AMP INC	SHELL-CCNN, RECT, .665 WD X.850	83-1610-0929	4	
T1		17644	ADC	XFMR-POWER, STEPPDOWN, 110 V	83-1540-1321	1	
000001		60618-4	AMP INC	CONTACT-ELFC, PIN, .084 DIA	83-1610-0925	36	
000002		60510-4	AMP INC	CONTACT-ELFC, SOC, 18-22GA SIZE	83-1610-0927	36	
000003		GSR134C	THOM & BETTS	FERRULE-RF CABLE GND .134ID	83-9690-0020	6	
000004		GSC194C	THOMAS & BETTS	FERRULE-RF CABLE GROUNDING	83-9690-0118	6	
000005		NR1934N2SJ	NATL WIRE	WIRE-TYPE B, 22GA RED/BLU 2 CCN	83-7910-0362	AR	

LAST OF 2 PAGES

M E G P A R T S L I S T

TITLE PWR SUP ASSY-ELECT,4 TRACKS

CATALOG NO. 83-5920-1821

PL 64031ACCC-1

REV A

REF.DES./FIND # ---EFF--- DRAWING NUMBER MEGR NAME D E S C R I P T I O N PF CATALOG NUMBER QTY.
BEG. END. - MEGR PART NO.

C1		HC5020A	MALLORY	CAP-FXC,ELECT,2000 UF,50 WVCC	83-1510-2075	1
C2,C4	468	CS13BF476K	MIL STD	CAP-FXC,TA 47 UF, 35 V, 10%	83-1510-6085	2
C3	468	DD102	AFRCVOX	CAP-FXC,CFR, 1000PF 1000V GMV	83-1510-1024	1
CR1,CR2,CR3,CR4,	468	IN4004	MOTOROLA	RECT-SI,DIF JCT,400PIV 1 AMP	83-1530-0151	5
CR5						
CR6	468	IN754A	TEXAS INST	DIODE-SI, ZENER, 6.8V 400 MW	83-1530-0097	1
F1	468	312002	LITTELFUSE	FUSE-2AMP 250V 3AG QUICK	83-7550-8008	1
Q1		2N3055	R.C.A.	TSTR-SI,APN, PWR, 100 VCR	83-1530-2157	1
Q2,Q3,C4	468	2N3417	G.F.	TSTR-SILICON,NPN,SMALL SIGNAL	83-1530-2236	3
R1	468	BWH	INTNATNL RES	RESISTOR-WW 1 OHM, 1W, 10%	83-1520-8261	1
R2	468	4334	OHMITE	RES-FXC,W/W,1.5 OHM 3 W 5 %	83-1520-7771	1
R3	468	0A781-7148	MINCOM SPEC	RES-FXD,FILM,1CK CHM,1/2W,2% S	83-1520-7148	1
R4,R6	468	0A781-7147	MINCOM SPEC	RES-FXC,FILM,4.7K CHM,1/2W,2%	83-1520-7147	2
R5	468	0A781-7350	MINCOM SPEC	RES-FXD,FILM,330 CHM,1/2W,2% S	83-1520-7350	1
R7	468	0A781-7372	MINCOM SPEC	RES-FXD,FILM,22K CHM,1/2W,2% S	83-1520-7372	1
R8	468	0A781-7368	MINCOM SPEC	RES-FXD,FILM,7.5K CHM,1/2W,2% S	83-1520-7368	1
R11	468	LITTLE DEVIL	OHMITE	RES-FXD,COMP,270 CHM 1W 5%	83-9520-4091	1
R12	468	RC32GF3315	MIL-R-11D/6	RESISTOR-CARBON, 330 OHM 1W-5%	83-9520-4140	1
R13	468	LITTLE DEVIL	OHMITE	RESISTOR-CAR, 220 CHM-1W-5%	83-9520-4137	1
000001		CMC-28A	SPRAGUE	RETAINER-CAP MTG,RING TYPE	83-1650-0148	1
000002		BBTC-3-62	BRUSH-BERYLM	PAO-TSTR,1.05 WC X 1.563 LG	83-1690-0187	1
000003		23059AC17	MINCOM	CHAS-COMP MTG,SIG ELECTRONICS	83-3310-0852	1
000004		23059A011	C MINCOM	PLATE-MTG,METER MODULE	83-3320-1126	1
000005		23059AC08	MINCOM	BRKT-METER MTG,SIG ELECTRONICS	83-3320-1131	1
000006		23059AC09	MINCOM	SPACER-METER PANEL,SIG ELFC	83-3350-0384	4
000007	468	23059PC56	A MINCOM	PC3230-FCWER SUPPLY	83-3640-1872	1
000008		7856	WALSCO	INSULATOR-WASHER,.140 ID	83-9630-0036	2
000009		1414-6	PF SMITH	TERM STRIP-GNDING,#6 SCREW MTG	83-9630-0086	1

M64 PAR 2-71

MFG PARTS LIST

TITLE PWR SUP ASSY-ELECT, 4 TRACKS

CATALOG NO. 83-592C-1821

PL 64031A000-1

REV A

REF.DES./FIND #	---FFF---	DRAWING NUMBER	MFGR NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.
REQ. END.		- MFGP PART NO.				
000010	415	23028A045-2	A MINCOM	PLATE-COVER, DISPLAY PANEL	83-3320-2358	1
000011	415	04032.C02-1	E MINCOM	HANDLE-FULL, 1.517 LCNG	83-3270-0144	1
000012	468	7717-2	THERMALLOY	PAD-TSTR, INLINE, 3 LEADS	83-9690-0191	3
000014	468			TUBING-TFFLON, #18 .047 ID, NAT	83-7910-0333	AR

LAST OF 3 PAGES

M F G P A R T S L I S T

TITLE PWR SUP ASSY-FLECT, 2 TRACKS CATALOG NO. 83-5920-1822 PL 64031A000-2 REV A
REF. DES. / FIND # ---EFF--- DRAWING NUMBER MFGR NAME D E S C R I P T I O N PH CATALOG NUMBER QTY.
BFG. END. - MFGR PART AC.

SAME AS 64031A000-1 EXCEPT FOR F1, T1, 000007, AND 000014

F1	468	31201.5	LITTELFUSE	FUSE-3AG-1.5 AMP.	83-7550-8009	1
T1		23009AC04	A MINCOM	XFMR-POWER, TRANSPORT ELFCT	83-3540-1141	1
000007	468	23059AC56	D MINCOM	PC704-PCWER SUPPLY, SIG ELECT	83-3640-0597	1

M E G P A R T S L I S T

TITLE PWR SUP ASSY-ELECT, 2 TRACKS		CATALOG NO. 83-5920-1822	PL 64031A000-2	REV A
REF.DFS./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N
	BFG. END.	- MEGR PART NO.		PH CATALOG NUMBER QTY.
000014	468	#EXF-22-122	THERMAX	WIRE-TYPE C, 22GA WHT TFFLN JKT 83-7910-0476 AR

M F G P A R T S L I S T

TITLE HSG ASSY-SIG FLECT,REC/REF		CATALOG NO.	83-4930-2980	PL	64059A010	REV	C
REF.DES./FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.	
REG. END.	-	MEGR PART NO.					
C101		CSI3BF476K	MIL STD	CAP-FXD,TA 47 UF, 35 V, 10%	83-1510-6085	1	
CR101,CR102,	467	IN4004	MOTOROLA	RECT -SI,DIF JCT,400PIV 1 AMP	83-1530-0151	3	
CR104							
DS103		RDL-A1F1-0000	TSTR ELECT	LIGHT-INDICATOR,P2STC,RED	83-1550-2582	1	
J101		D3F	SWITCHCRAFT	CONN-RECP,ELEC,FNL MTG, 3 SOC	83-1610-1105	1	
J102		D3M	SWITCHCRAFT	CONN-RECP,ELEC,FNL MTG, 3 PIN	83-1610-1106	1	
J103		N-111	SWITCHCRAFT	JACK-TEL,2 CONDUCTOR,INSULATED	83-1610-0885	1	
J104,J105,J106,		MS3102F10SL-3P	MIL STD	CCNN-RECP,BOX MTG,3 PIN CNT	83-1610-1510	5	
J107,J108							
J109,J111		1-480273-0	AMP INC	SHELL-CCNN,RECT,.565 WDX.65	83-1610-0923	2	
J110		1-480223-0	AMP INC	SHELL-CCNN,RECT,.650WDX1.280	83-1610-0934	1	
K101,K102		KHP17D11	PCTTR & BRUM	RELAY-4PDT,650 OHM 24VDC 3 AMP	83-1550-3550	2	
Q101		2N3391A	GENERAL ELEC	TSTR-SI,NPN, PWR, 25 VCB	83-1530-2230	1	
R100		302163	CTS OF BERNE	RES-VAR, WW, 2K OHM 5W 5%	83-1520-1299	1	
R101		0A781-7356	MINCOM SPEC	RES-FXD,FILM,620 OHM,1/2W,2% S	83-1520-7356	1	
R102,R118		0A781-7202	MINCOM SPEC	RES-FXD,FILM,150 OHM,1/2W,2% S	83-1520-7202	2	
R104,R105		0A781-7365	MINCOM SPEC	RES-FXD,FILM,5.6K OHM,1/2W,2% S	83-1520-7365	2	
R106		301073	CTS OF BERNE	RES-VAR,COMP,10K OHM,2W,30%	83-1520-1336	1	
R108		0A781-7350	MINCOM SPEC	RES-FXD,FILM,330 OHM,1/2W,2% S	83-1520-7350	1	
R110		LITTLE DEVIL	CHMITE	RES-FXD,COMP,33 OHM,1 W, 5%	83-9520-4120	1	
R114		LITTLE DEVIL	CHMITE	RES-FXD,COMP,270 OHM 1W 5%	83-9520-4091	1	
R115,R117		LITTLE DEVIL	CHMITE	RES-FXD,COMP,390 OHM 1W 5%	83-9520-4142	2	
R116		0A781-7360	MINCOM SPEC	RES-FXD,FILM,2.2K OHM,1/2W,2% S	83-1520-7360	1	
R119		0A781-7359	MINCOM SPEC	RES-FXD,FILM,1.2K OHM,1/2W,2% S	83-1520-7359	1	
R120		0A781-7367	MINCOM SPEC	RES-FXD,FILM,6.8K OHM,1/2W,2% S	83-1520-7367	1	
S101		SFF DESC	DIALCO	SWITCH-FB, 922-1141-1572-523	83-1550-5227	1	

M64 PAR 2-71

M F G P A R T S L I S T

TITLE HSG ASSY-SIG FLECT, RFC/RFP		CATALOG NO. 83-4930-2980		PL 64059A010		REV C
REF.DES./FIND #	---FFF---	DRAWING NUMBER	MFGR NAME	D E S C R I P T I O N	PH CATALOG NUMBER	QTY.
	REG. FNC.	- MFGR PART NO.				
S102		SEE DESC	DIALCO	SWITCH-FB, 922-1141-1573-523	83-1550-5226	1
S103, S104		00000A952-2	A MINCOM	SWITCH-ROT, PHEN, 115VAC 230 MA	83-1550-5225	2
S105		SS43	STACKPOLF	SWITCH-SLIDE, SP 3 POSITION	83-1550-5228	1
S106		SS50	STACKPOLF	SWITCH-SLIDE, DPDT	83-1550-5229	1
T101		23059A025	B MINCOM	XFMR-AUDIO INPUT	83-3540-1122	1
T102		23059AC29	A MINCOM	XFMR-AUDIO OUTPUT, SIG ELECT	83-3540-1109	1
T81, T82		4-01769	ALCON	TERM BD-5 POS, .325 WD X1.312 LG	83-1640-0625	2
000001		23059AC01-1	D MINCOM	PLATE-HSG MTG, RH, SIG ELECT	83-3320-1128	1
000002		23059A001-2	D MINCOM	PLATE-MTG, HSN, RH, SIGNAL FLECT	83-3320-1129	1
000003		23059A006-1	E MINCOM	PLATE-PANEL MTG, LH, SIG ELECT	83-3320-1130	2
000005		23059AC04	B MINCOM	SUPPORT-ROD, GUIDE, P.C. BGARD	83-3340-0389	4
000006		23059A024	E MINCOM	BRACKET-XFMR MTG, SIGNAL ELECT	83-3320-1133	2
000007		23059AC26	B MINCOM	BRACKET-SLOTTED, DOOR STOP	83-3320-1127	1
000008		23059A003-2	A MINCOM	PANEL-FRONT, SIGNAL ELECTRONICS	83-3360-1663	1
000011		23059A013-1	B MINCOM	HINGE-BUTT, DOOR LEAF, LH	83-3270-0475	1
000012		23059A013-2	B MINCOM	HINGE-BUTT, DOOR LEAF, RH	83-3270-0476	1
000013		R102-125	SCANBE	SPACER-GUIDE, P.C. BD, .125 THK	83-1350-0385	8
000014		00000A614-7	G MINCOM	SPACER-P.C. BD, CHAN, .500 LG	83-3350-0236	16
000015		00000A614-9	G MINCOM	SPACER-P.C. BD, CHAN, .625 LG	83-3350-0238	16
000016		00000A614-21	G MINCOM	SPACER-P.C. BD, CHAN, 2.941 LG	83-3350-0386	4
000017		00000A614-22	G MINCOM	SPACER-P.C. BD, CHAN, 3.190 LG	83-3350-0387	8
000018		23059A002	D MINCOM	PANEL-CONNECTOR MTG, SIG ELECT	83-3360-0730	1
000019		23059A007	B MINCOM	PANEL-FRONT, COMPONENT MTG	83-3360-0729	1
000020		C91-0024-000	VIKING	INSERT-CLARIZING, CONN, .300 LG	83-1610-0760	9
000023		23059A028	B MINCOM	SPRING-DOOR CATCH, SIG ELECT	83-3280-0447	1
000031		KL7C1	RAYTHEON	LOCK-DIAL, KNOB, RD, 1.00 DIA	83-1270-0388	2
000032		DS70-1-2	RAYTHEON	KNOB-CONTROL, RD, UNSKIRTED	83-1270-0486	2
000033		DS70-3-2	RAYTHEON	KNOB-CONTROL, RD, SKIRTED	83-1270-0487	2
000034		327	GENERAL ELEC	LAMP-INCANDESCENT, .04 AMP	83-1550-2506	3
000035		R-301-51A	SCANBE	GUIDE-P.C. BD, 5.287 LG	83-1340-0393	20
000037		9KH1	PCT.BRUM	SOCKET-RELAY, 14CONT	83-1620-0108	2

M64 PAR 2-71

MFG PARTS LIST

TITLE HSC ASSY-SIG ELEC, REC/REP		CATALOG NO.	83-4930-2980	PL	64059A010	REV	C
RFF.DFS./FIND #	---EFF---	DRAWING NUMBER	MFG NAME	DESCRIPTION		PH CATALOG NUMBER	QTY.
BEG. END.		- MFG PART NO.					
000038		2VK22S/1-2	VIKING	CONN-P.C., ELEC, PIERCD,	22 CON	83-1610-0845	9
000044		60510-4	AMP INC	CONTACT-ELEC, SCC, 18-22GA	SIZE	83-1610-0927	27
000059		SE-45 BRASS	UNITED SHOE	FYELET-MET,	.121 OD X.169LG	83-7290-0097	4
000060	1547	7308	WALSCO	BUTTON-FLUG, FOR	.375 DIA HOLE	83-7270-0139	1
000061		KHP	POTTER/BRUMF	SPG-HOLD DOWN, RELAY		83-1280-0571	2
000062		23059A012-1	B MINCOM	LABEL-I.D, NAB & DYNATRACK,	LH	83-3550-1573	1
000063		23059A012-2	B MINCOM	LABEL-I.D, NAB & DYNATRACK,	RF	83-3550-1574	1
000064		00000A769	C MINCOM	LABEL-IDENTIFICATION, MODULE		83-3550-1621	1
000065		YEC 120	BURNDY	FERRULE-RF CABLE GND,	.300 OD	83-9690-0240	18
000066		YEC-100	BRUNDY	FERRULE-RF CABLE YEL,	.270 OD	83-9690-0212	32
000067			NATIONAL	WIRE, PVC, SHIELDED	24GA 2COND	83-7910-0511	AR
000068			NATL WIRE	WIRE-TYPE B, 22GA	WHT NYLON JKT	83-7910-0052	AR
000069		1561-2	ALPHA WIRE	WIRE-TYPE MW, 22GA	BLK NYLN JKT	83-7910-0460	AR
000070		1561-3	ALPHA WIRE	WIRE-TYPE MW, 22GA	RED NYLN JKT	83-7910-0461	AR
000071		1561-8	ALPHA WIRE	WIRE-TYPE MW, 22GA	ORNG NYL JKT	83-7910-0462	AR
000072		1561-5	ALPHA WIRE	WIRE-TYPE MW, 22GA	YEL NYLN JKT	83-7910-0463	AR
000073		1561-6	ALPHA WIRE	WIRE-TYPE MW, 22GA	BLU NYLN JKT	83-7910-0464	AR
000074		1561-1	ALPHA WIRE	WIRE-TYPE MW, 22GA	WHT NYLN JKT	83-7910-0467	AR
000075			NATL WIRE	WIRE-PVC, TYPE B,	22GA YELLOW	83-7910-0040	AR
000076			NATL WIRE	WIRE-TYPE B, 22GA	VIO NYLON JKT	83-7910-0041	AR
000077			NATL WIRE	WIRE-PVC, TYPE B,	22GA GRAY	83-7910-0042	AR
000078		MIL-W-16878	NATL WIRE	WIRE-TYPE B, 22GA	WHT NYLON JKT	83-7910-0043	AR
000079			NATL WIRE	WIRE-TYPE B, 22GA	BLU NYLON JKT	83-7910-0044	AR
000080			NATL WIRE	WIRE-TYPE B, 22GA	BLK NYLON JKT	83-7910-0045	AR
000081			NATL WIRE	WIRE-TYPE B, 22GA,	GRN NYLN JKT	83-7910-0248	AR
000082			NATL WIRE	WIRE-TYPE B, 22GA	RED NYLON JKT	83-7910-0249	AR
000083			NATL WIRE	WIRE-TYPE B, 22 GA	ORNG NYL JKT	83-7910-0250	AR
000084			SURPRENANT	WIRE-PVC TYPE B,	22 GA, RED-BLK	83-7910-0066	AR
000085			SURPRENANT	WIRE-PVC, B NYLCN,	22GA, YEL-BLK	83-7910-0067	AR
000086			SURPRENANT	WIRE-PVC, B NYLCN,	22GA, GRN-BLK	83-7910-0069	AR
000087			SURPRENANT	WIRE-PVC, B NYLCN,	22GA, BLU-PLK	83-7910-0070	AR
000088			NATL WIRE	WIRE-TYPE B, 22GA	WHT/BLK NYLN	83-7910-0262	AR
000089			NATL WIRE	WIRE-TYPE B, 22GA	CRN/BLK NYLN	83-7910-0297	AR

M64 PAR 2-71

201

M E G P A R T S L I S T

TITLE HSG ASSY-SIG ELECT, REC/REP

CATALOG NO. 83-4930-2980

PL 64059A010

REV C

REF. DES. / FIND #	---EFF---	DRAWING NUMBER	MEGR NAME	DESCRIPTION	PH CATALOG NUMBER	QTY.
	REF. END.	- MEGR PART NO.				
000090			NATL WIRE	WIRE-TYPE B, 22GA GRY/BLK NYLN	83-7910-0298	AR
000091			NATL WIRE	WIRE-TYPE B, 22GA PR/BLK NYLN	83-7910-0299	AR
000092			NATL WIRE	WIRE-PVC, B NYLCN, 22GA, BPN-BLK	83-7910-0300	AR
000093				WIRE-TYPE B, 22 GA, VIOLET-WHITE	83-7910-0068	AR
000094			SURPRENANT	WIRE-PVC, B NYLON, 22GA, BLK-WHT	83-7910-0071	AR
000095				WIRE-TYPE B, 22 GA YELLOW NYLN	83-7910-0259	AR
000096			NATL WIRE	WIRE-PVC TYPE B, 22 GA, GRN-WHT	83-7910-0260	AR
000097				WIRE TYPE B, 22 GA GRAY NYLN	83-7910-0261	AR
000098				WIRE-TYPE B, 22 GA RED NYLN JKT	83-7910-0264	AR
000099				WIRE-TYPE B, 22 GA BLU NYLN JKT	83-7910-0288	AR
000100				WIRE-TYPE B, 22GA BRN NYLN JKT	83-7910-0301	AR
000101				WIRE-TYPE B, 22 GA DRN NYLN JKT	83-7910-0303	AR
000102		MS35206-205	MIL STD	SCREW-MACH, PAN HD, 2-56 X 3/8	83-9260-4504	2
000103				WASHER-FLAT, SM PATT, #2	83-9261-4011	2
000104		MS35338-39	MIL STD	WASHER-LOCK, SPLIT, HELICAL, #2	83-9261-4301	2
000105				NUT-HEX, SM PATT, 2-56 X .156 WD	83-9260-2206	2
000106		PAR53	THCMS & BFFS	TERM-LUG, INSUL, R TG, .26WD	83-9630-0203	2
000107		MS35333-42	MIL STD	WASHER-LOCK, FLAT, INT T, #3/8	83-9261-4211	2
000108		M-2766	ALLEN BRADLY	NUT-HEX, PLAIN, 3/8-32 X .500 DD	83-9260-2112	4
000109	1525	23059B027	A MINCOM	ROD-DOOR STOP, SIG ELECT	83-3280-0940	1
000110	1527	23059A014-3	B MINCOM	HINGE-BLTT, CHASSIS HALF	83-3270-0479	1

LAST OF 5 PAGES

M64 PAR 2-71

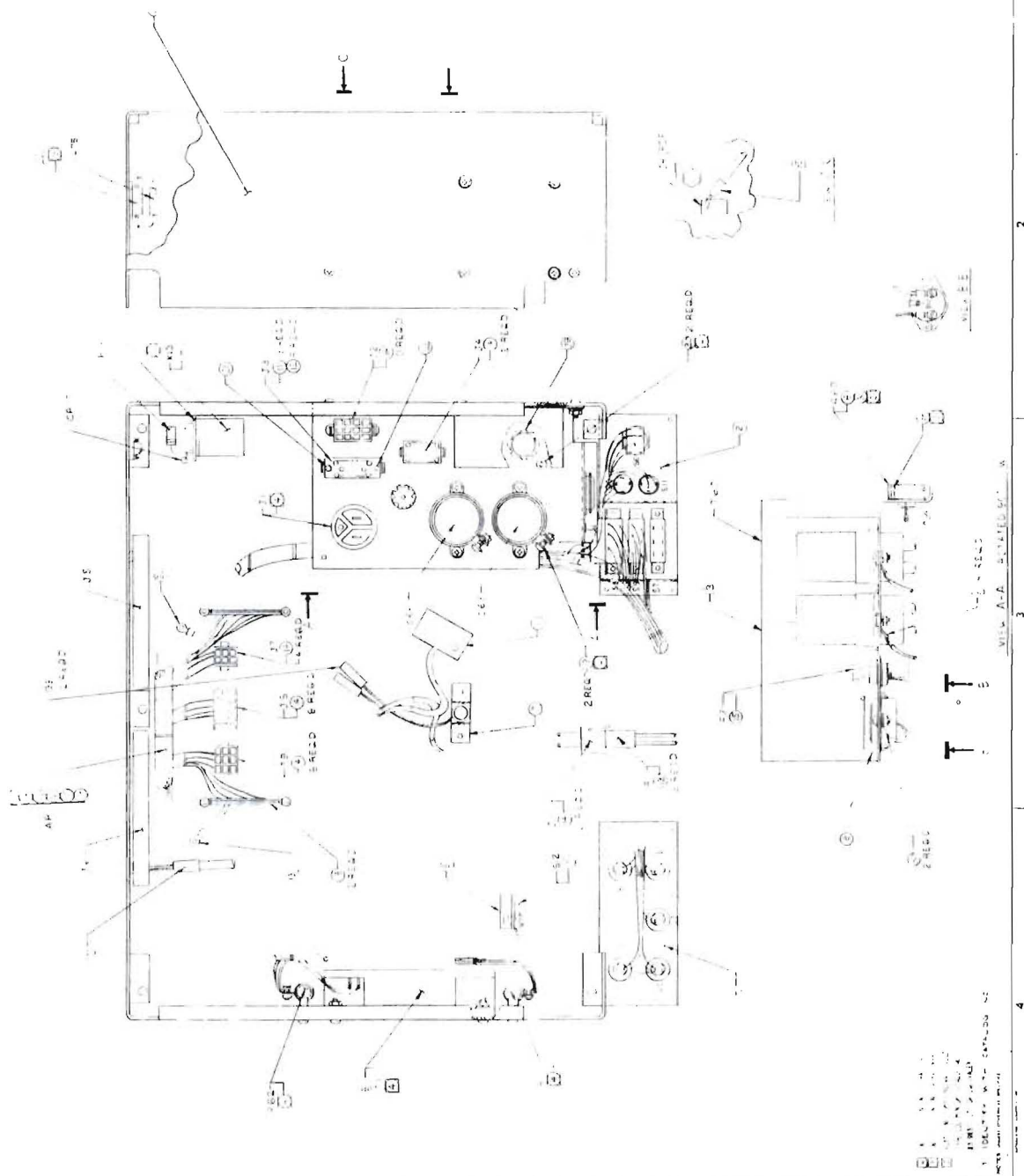


Figure 37. Remote Control Assembly